State of California The Resources Agency

Memorandum

Date : September 1, 2000

To : Dave Duval, Chief
Delta Field Division, O&M

Ron Lee, Chief
Civil Engineering Branch, DOE

Kamyar Guivetchi, Program Manager
Suisun Marsh Branch, ESO

From : **Department of Water Resources**

Subject: Overview of Morrow Island Fish Screen Project Alternative Selection [1]

This memorandum: (1) provides background on the Morrow Island Distribution System (MIDS) Fish Screen Project; (2) summarizes project planning, stakeholder involvement, peer review, and the alternative selection process; (3) responds to inquiries from the Division of Engineering; and (4) recommends proceeding with the Hybrid Alternative, initiating final design for the DOE portion of the project, and making a concerted effort to complete all or most of the project by October 1, 2001. To keep this memorandum concise, I have cited documents that were distributed previously to the MIDS Environmental Coordination Advisory Team, included detailed information in the attachments, and used footnotes to indicate responses to DOE inquiries [2].

Project Need and Purpose

The screening of Morrow Island Distribution System diversions is a condition of U.S. Army Corps of Engineers Permit No. 20698N (July 1997) and U.S. Fish and Wildlife Biological Opinion for maintenance activities completed on the MIDS. The permit required the installation and operation of a fish screen by October 1999. DWR has requested and received two, one-year extensions from U.S. Fish and Wildlife Service, ending October 1, 2001.

The purpose of the MIDS Fish Screen Project is to prevent fish entrainment onto managed wetlands served by the MIDS, while maintaining sufficient capacity and water quality to enable landowners to follow their wetland Management Plans, required by the Suisun Marsh Preservation Agreement and existing Right of Way agreements. The U.S. Bureau of Reclamation pays 40 percent of SMPA implementation, including the MIDS Fish Screen Project.

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[1] The MIDS Environmental Coordination Advisory Team (ECAT) has agreed to include restoring the Goodyear Slough Outfall structure in the DWR contract for the MIDS Fish Screen Project. This component of the project is not discussed in this memorandum.

[2] DOE inquiries are listed in Attachment 1. Footnotes are used throughout this memorandum to indicate responses to specific inquiries using identification numbers 1 – 6, as they appear in Attachment 1.

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DWR 155 (Rev 2/86)

Project Planning History

The MIDS Environmental Coordination Advisory Team was established in 1997 to facilitate the MIDS Maintenance Project [3]. In 1998, ECAT took up the Fish Screen Project. The planning/preliminary design for the fish screen project occurred in four sequential phases as summarized below.

Phase 1 - Conceptual Designs for a Single Large Intake Fish Screen Facility

Initial planning focused on a large fish screen facility at the MIDS intake on Goodyear Slough. Environmental Services Office Fish Facilities Section developed several conceptual designs. The MIDS ECAT evaluated eight screening concepts and selected two alternatives for DOE preliminary design: (1) inclined flat-plate screen and (2) array of conical screens. This phase was completed in August 1998.

Phase 2 - Preliminary Designs for Two Large Intake Fish Screen Alternatives

DOE prepared preliminary designs and cost estimates for the two large centralized fish screen alternatives. The Central Valley Fish Facility Review Team evaluated the designs and ECAT members met with the team to discuss comments. The Review Team considered the conical array alternative design acceptable and recommended several modifications to the inclined screen design. DOE incorporated the changes and the team considered the modified design acceptable. The two large screen designs were presented to the MIDS ECAT and Suisun Marsh Preservation Agreement ECAT [4]. This phase was completed in August 1999 (Note: at this time, project completion was due by October 2000 after receiving the first one-year extension).

Phase 3 - DWR Recommendation to USFWS for Off-Site Restoration Project

Before proceeding with final design and construction of a large centralized intake fish screen, DWR Executive/ESO Management asked that we propose to the USFWS that the estimated funds needed to build a large intake screen be used to restore shallow water habitat in Suisun Marsh, in lieu of the large fish screen. This proposal is based on DWR's opinion that the restoration project would be more beneficial to fish than the fish screen. However, in October 1999, the USFWS did not agree to off-site restoration because they interpret the Endangered Species Act to require direct mitigation for potential take of fish at a diversion.

Phase 4 - USFWS Recommendation to Evaluate "Fish Friendly" Alternatives

In October 1999, the USFWS addressed the negative aspects of constructing a large fish screen facility in the Suisun Marsh, such as fixed structures in wetlands,

[3] The MIDS ECAT is an ad hoc team, as described in Water Resource Engineering Memorandum 58a, consisting of staff from DWR's O&M HQ, Delta Field Division, ESO (Suisun Marsh Branch, Fish Facilities Section, and Environmental Review Branch), DOE, Land and Right of Way, Legal, and USBR Fish Facilities Section.

[4] The SMPA ECAT includes representatives from DWR, USBR, Department of Fish and Game, Suisun Resource Conservation District, USFWS, NMFS, and USACE.

construction impacts, and aesthetics. USFWS suggested that we broaden the alternative evaluation to include "fish friendly" alternatives other than large intake fish screens. Such alternatives included opening the MIDS to tidal flow and using screened portable diversion pumps, as described in SMPA Amendment Three. USFWS also agreed to a second one-year extension to October 2001, if DWR considered other alternatives.

The MIDS ECAT decided to proceed with a feasibility study of other "fish friendly" alternatives. The Suisun Marsh Branch facilitated this second round of conceptual planning and peer review, resulting in nine additional alternatives by the end of February 2000.

Stakeholder Involvement and Peer Review

The Suisun Marsh Branch facilitated considerable stakeholder involvement, peer review, and regulatory oversight throughout the four planning phases. Stakeholders included members of the MIDS and SMPA ECATs, landowners, Suisun Resource Conservation District Board of Directors, DWR Fish Facility Coordination Team, Central Valley Fish Facility Review Team, and Suisun Marsh Regulatory Group [5]. Stakeholder involvement increased during the evaluation of the "fish friendly" alternatives. Significant stakeholder meetings and events since September 1999 are listed in Attachments 2 and 3.

Selection Criteria for Comparing Alternatives

The following twelve evaluation criteria were used to compare alternatives:

1. Acceptability to landowners
2. Water quality
3. Environmental impacts
4. Permitting requirements
5. Time required to implement
6. Managed wetland operational flexibility
7. Redeployment / salvage potential
8. Reduction of system sedimentation
9. Operation and maintenance (resources and cost)
10. Consistency with Suisun Marsh Preservation Agreement Amendment Three
11. Procurement requirements
12. Approximate capital cost ($ millions)

The evaluation criteria and five relative ratings are listed in Table 1. DOE provided the approximate capital cost for the two large intake fish screen alternatives

[5] The Suisun Marsh Regulatory Group is comprised of representatives from State and federal regulatory agencies that authorize actions/projects in Suisun Marsh, including the: USACE, EPA, NMFS, USFWS, DFG, Bay Conservation and Development Commission, and SF-Regional Water Quality Control Board.

and for conversion of internal to external levees required for the open system alternative. The Suisun Marsh Branch prepared the other capital cost approximations as summarized in Attachment 4. While an important criterion, capital cost was not considered the sole or primary basis for selecting an alternative because of other critical considerations [6].

Project Alternatives

The eleven alternatives considered during the fourth planning phase are listed in Table 1, including the initial two large intake fish screens, six additional major alternatives, and three sub-alternatives. Alternatives are combinations of the following:

1. Fish screen technology (inclined flat-plate or conical; centralized or distributed);
2. MIDS mode of operation (fill and drain, drain only, gravity fill only - 12 hours/day, gravity and pump fill – 24 hours/day);
3. Fill water source (surface or ground water);
4. Land use change (purchase); and
5. Location of facilities (on MIDS or private lands).

The eleven alternatives are described in the following documents, which were distributed to the MIDS ECAT, SMPA ECAT, landowners, and other stakeholders.

1. Preliminary Design for two large intake fish screen alternatives (August 1999)
2. Fish Friendly Alternatives, MIDS (10 alternatives - February 2000)
3. Components and map of "Hybrid Alternative" for the MIDS (May 2000)
4. Environmental Impacts Analysis for the Proposed MIDS Fish Screen Installation (Version 1 – June 2000; Version 2 – August 2000)

Alternative Comparison Process and Results

Comparison results are reported in Table 1 (Comparison of "Fish Friendly" Alternatives for the MIDS). The Suisun Marsh Branch prepared Table 1 in consideration of extensive stakeholder input as chronicled in Attachments 2 and 3. The following determinations guided ESO in identifying and advancing the Hybrid Alternative for this project [7].

<u>Ground water development</u>

Developing groundwater would obviate the need for fish screens. However, it is not feasible based on a preliminary evaluation of local groundwater by Central District staff, and because of the potential for significant subsidence.

[6] Response to DOE inquiries 1 and 2 listed in Attachment 1.
[7] Response to DOE inquiries 1 and 2 listed in Attachment 1.

Land purchase

Purchasing any or all of the adjacent managed wetlands could reduce or eliminate the need for screening the MIDS if the purchased land was restored to tidal wetlands (landuse change). This option is not feasible because there are no willing sellers.

Drain-only system and mobile pumps with fish screens

Using mobile pumps with screens in conjunction with operating the MIDS as a drain-only system has many potential benefits. However, this is not feasible because there is, as yet, no commercially available portable fish screen with proven performance.

Open system with distributed fish screens

Operating the MIDS as an open system (both sub-alternatives) would have significant environmental impacts because of additional wetland fill required to increase the MIDS levee dimensions from interior to exterior levees. These two alternatives would cost approximately double all other alternatives because of the required levee work, and because they would still require distributed fish screens to serve the adjacent wetlands.

Smaller intake fish screen facility using pumps and gravity inflow

Operating the MIDS with combined gravity and pump fill (24 hours per day) would result in a centralized intake fish screen about half the size of the large fish screen option (both inclined flat-plate or conical screen array). These two alternatives were unacceptable to landowners because of pump noise, and to DWR O&M because of maintenance requirements.

Large centralized intake fish screen facility

Constructing either large intake fish screen (inclined flat-plate or conical array) would accomplish the project objective at a competitive capital cost. However, the large facilities were not favored by two landowners, and strongly opposed by one landowner. To provide necessary boat access in the external slough, the large screen facilities would be recessed into the existing levee. The Mulberry Club strongly opposes these two options because of the proximity of its clubhouse to the MIDS intake. The large fish screen alternative would also have little salvage value if any or all of the managed wetlands were restored to tidal [8].

[8] Response to inquiry 1 listed in Attachment 1.

Drain-only system with distributed conical fish screens

Operating the MIDS to only collect drainage and installing distributed conical screens on the adjacent private lands has many advantages and was advanced as a preferred alternative by the Suisun Marsh Branch in February and March 2000 meetings with the SMPA ECAT, regulatory agencies, and landowners. No intake fish screen would be required for the MIDS and sediment accretion associated with inflow to the MIDS would be greatly reduced, significantly reducing the need and cost for future dredging. The distributed conical fish screens are proven technology in Suisun Marsh, with 13 screens installed and operating during the past four years [9]. However, the three landowners did not support the drain-only concept because water management practices on the eastern third (about 400 of 1400 acres) of the MIDS service area requires using the MIDS M-line and C-line ditches for water supply (areas are shaded on map in Figure 1) [10]. Also, the installation of fish screens that would be required along Grizzly Bay would adversely impact existing fringe tidal marsh along the exterior levees.

Hybrid Alternative

Based on landowner constraints and input, the Hybrid Alternative was developed by modifying the drain-only, distributed screen alternative to include a small intake fish screen facility on the MIDS that would provide about 50 cubic feet per second to about 400 acres on the eastern side of the island [11]. Features of the Hybrid Alternative are shown on the map in Figure 2. Five distributed conical screens on two of the three properties would provide the balance of the necessary flow. The Hybrid Alternative has many of the advantages of the drain-only, distributed screen alternative noted above, as well as, landowner acceptance, no significant environmental impacts, an estimated capital cost comparable with the large intake screen alternatives, opportunity for redeployment, and low operation and maintenance costs relative to some of the other alternatives [12].

Fish Screen Performance in Suisun Marsh

The reasons for implementing the Hybrid Alternative are presented in Table 1 and discussed above. Two side-by-side conical fish screens would be installed at the MIDS intake and five conical screens would be distributed on two of the three adjacent properties (Figure 2). The conical fish screen is recommended for this project because SRCD directed its design for conditions unique to Suisun Marsh (SRCD Fish Screen Program, 1996), and its operational success. Since 1996, SRCD has successfully installed and operated 13 conical fish screens in Suisun

[9] Response to inquiry 2 listed in Attachment 1.
[10] Response to inquiry 3 listed in Attachment 1.
[11] Response to inquiry 3 listed in Attachment 1.
[12] Response to inquiries 1 and 2 listed in Attachment 1.

Marsh, one of which was constructed on Lower Joice Island under contract with DWR [13].

The conical fish screen design and installations were reviewed by the Central Valley Fish Facilities Review Team and were certified operational by the National Marine Fisheries Service. The screens have performed well and have had relatively low maintenance and repair costs as listed in Attachment 5. Another attribute of the conical screen is the potential to redeploy (salvage) any or all of the seven screens if lands serviced by the MIDS are restored to tidal wetlands in the future. In addition, DWR has the opportunity to install the conical screens on privately owned wetlands through a contract with the Suisun Resource Conservation District, under SRCD's Regional General Permit.

Intake Screens, Incorporated; and Borcalli and Associates developed the conical screen design for SRCD and jointly hold patents on the conical screen design, including the screen shape, screen sweeper, brush cleaner, and flow distribution control mechanism. The details of these patents are included in Attachment 6. The components of the Hybrid Alternative included in these patents may require a sole-source justification or may be explicitly described in the contract specifications [14].

Other fish screen technologies in Suisun Marsh have had performance and operational problems, with high retrofit costs. While the proposed inclined flat-plate screen facility now includes several features recommended by the Fish Facilities Review Team (such as flow meters, louvers, removable screen panels, and isolated flow chambers); it has not been tested in Suisun Marsh. Potential concerns about the proposed large inclined fish screen facility are: (1) constructing a large fixed facility in Suisun Marsh (inconsistent with SMPA Amendment Three); (2) potential for subsidence associated with a concrete-based structure on soft Marsh soils; (3) cost/effort associated with sediment/debris collection and removal; (4) no opportunity for relocation or salvage; and (5) unacceptability to landowners (facility size) [15].

Project Implementation

ESO's Suisun Marsh Branch and Fish Facilities Section recommend proceeding with the Hybrid Alternative in a timely fashion with the goal of implementing all, or most of the project by October 2001.

DOE would design and construct all components of the Hybrid Alternative directly on the MIDS [16], which include:

- Two side-by-side conical fish screens (western end of MIDS);
- One 48-inch diameter drain culvert pipe (western end of the MIDS);

[13] Response to inquiry 2 listed in Attachment 1.
[14] Response to inquiries 5 and 6 listed in Attachment 1.
[15] Response to inquiry 1 listed in Attachment 1.
[16] Response to inquiry 4 listed in Attachment 1.

- One 36-inch diameter fill turnout culvert on C-Line ditch; and
- One 36-inch diameter combination fill/drain turnout culvert on M-Line.

I recommend that O&M request that DOE begin the final design and contracting process for this work this September.

The five distributed conical screens on the privately owned wetlands would be contracted to SRCD and constructed under their USACE Regional General Permit. I have included a draft Request for Proposal for SRCD's portion of the Hybrid Alternative in Attachment 7. The RFP covers project oversight, design, construction, operation and monitoring, and as an option, ongoing maintenance and repairs [17].

To reduce paper transmittals, we have placed this memorandum on the Suisun Marsh Program website (address below). If you have questions, please contact me at (916) 227-7529 or email kamyarg@water.ca.gov, or Mike Floyd at (916) 227-7520 or email mfloyd@water.ca.gov.

Attachments

cc: Distribution list: Electronic copy available at web address:
http://iep.water.ca.gov/suisun/curr-report/currrep.html

Select: *Overview of Morrow Island Fish Screen Project Alternative Selection*

[17] Response to inquiry 4 listed in Attachment 1.

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MIDS ECAT members

Table 1 Comparison of "Fish Friendly" Alternatives for the Morrow Island Distribution System

EVALUATION CRITERIA \ ALTERNATIVE	SCREENS AT THE MIDS INTAKE		SMALLER SCREEN FACILITY AT THE MIDS INTAKE USING PUMPS		OPERATION OF THE MIDS AS AN OPEN SYSTEM (WITH DISTRIBUTED SCREENS)		GROUND WATER DEVELOPMENT 1	LAND PURCHASE 2	OPERATION OF THE MIDS AS A DRAIN-ONLY SYSTEM		CONICAL SCREENS AT THE MIDS INTAKE AND DISTRIBUTED SCREENS "HYBRID PROPOSAL"
	INCLINED PLATE SCREEN	CONICAL SCREENS	INCLINED PLATE SCREEN	CONICAL SCREEN	OPEN CULVERTS	OPEN ENDS			MOBILE SCREENS AND PUMPS 3	DISTRIBUTED CONICAL SCREENS	
ACCEPTABILITY TO LAND OWNER(S)							Not Feasible	Not Feasible	Not Feasible		
WATER QUALITY											
ENVIRONMENTAL IMPACT											
PERMITTING REQUIREMENTS											
TIME REQUIRED TO IMPLEMENT											
MANAGED WETLAND OPERATIONAL FLEXIBILITY											
REDEPLOYMENT/ SALVAGE POTENTIAL											
REDUCTION OF SYSTEM SEDIMENTATION											
OPERATIONS AND MAINTENANCE											
CONSISTENCY WITH AMENDMENT III											
PROCUREMENT REQUIREMENTS											
APPROXIMATE COST (MILLIONS)	$2.2	$2.6	$2.1	$2.3	$4.6	$5.4				$2.1	$2.5

DWR, Suisun Marsh Branch 09/01/2000 rev. 2

KEY

- THIS RATING IS ASSIGNED WHEN RELATIVELY MINOR PROBLEMS/DIFFICULTIES OR NO PROBLEMS/DIFFICULTIES ARE EXPECTED TO EXIST WITH AN ALTERNATIVE IN RELATION TO THE GIVEN EVALUATION CRITERIA.
- THIS RATING IS ASSIGNED WHEN SMALL PROBLEMS/DIFFICULTIES ARE EXPECTED TO EXIST WITH AN ALTERNATIVE IN RELATION TO THE GIVEN EVALUATION CRITERIA.
- THIS RATING IS ASSIGNED WHEN MODERATE PROBLEMS/DIFFICULTIES ARE EXPECTED TO EXIST WITH AN ALTERNATIVE IN RELATION TO THE GIVEN EVALUATION CRITERIA.
- THIS RATING IS ASSIGNED WHEN SIGNIFICANT PROBLEMS OR DIFFICULTIES ARE EXPECTED TO EXIST WITH AN ALTERNATIVE IN RELATION TO THE GIVEN EVALUATION CRITERIA.
- THIS RATING IS ASSIGNED WHEN VERY SIGNIFICANT OR POSSIBLY INSURMOUNTABLE PROBLEMS OR DIFFICULTIES ARE EXPECTED TO EXIST WITH AN ALTERNATIVE IN RELATION TO THE GIVEN EVALUATION CRITERIA.

FOOTNOTES:

1. Not feasible because ground-water development potential is unknown at this time. Preliminary evaluation efforts indicate that ground-water production is not a viable alternative.
2. Not feasible at this time. No willing sellers of land have been identified.
3. Not feasible at this time. No commercially-available portable fish screens with a proven performance record were identified.

August 8, 2000

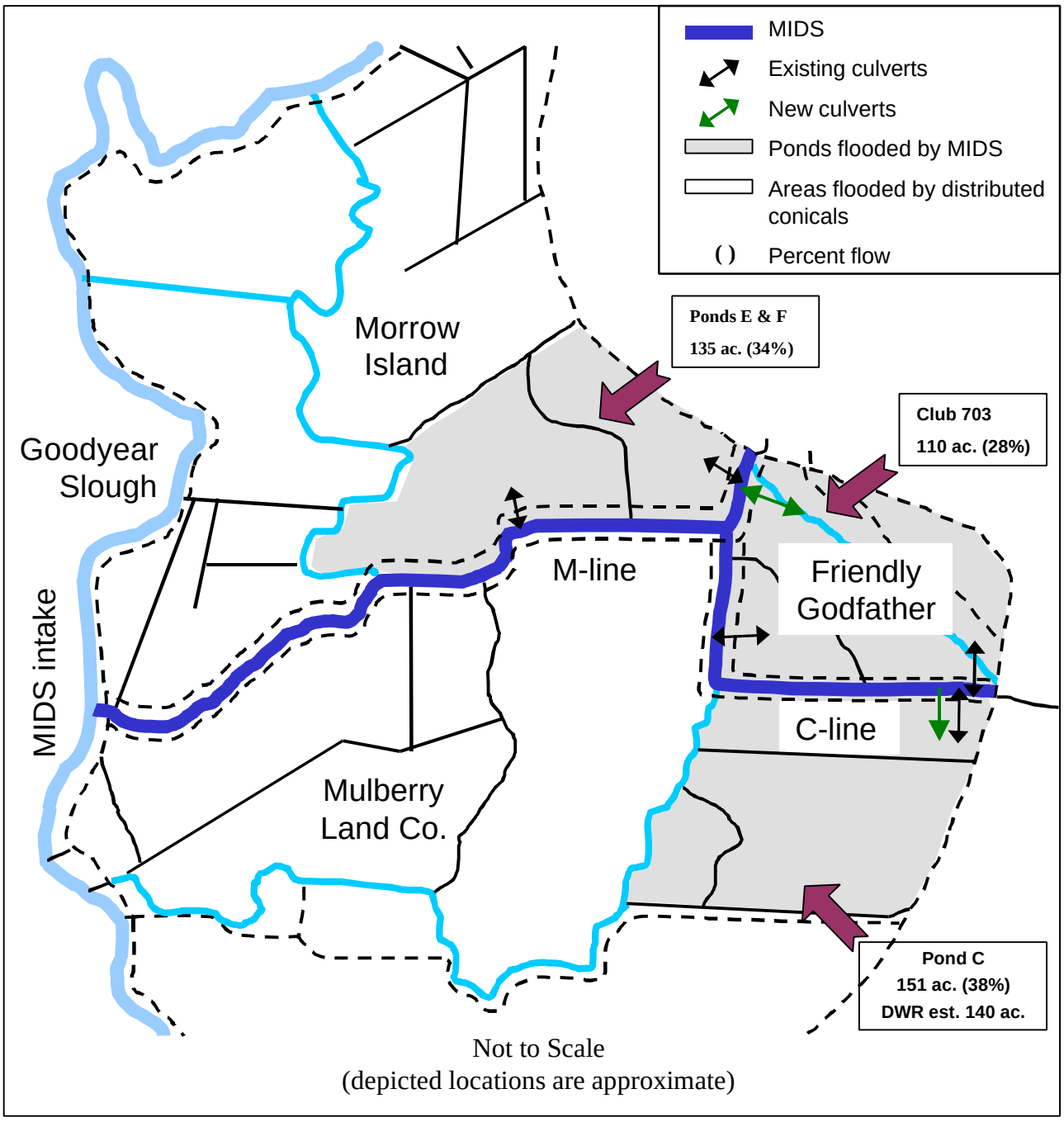

Figure 1 Ponds to receive screened water from MIDS (shaded)

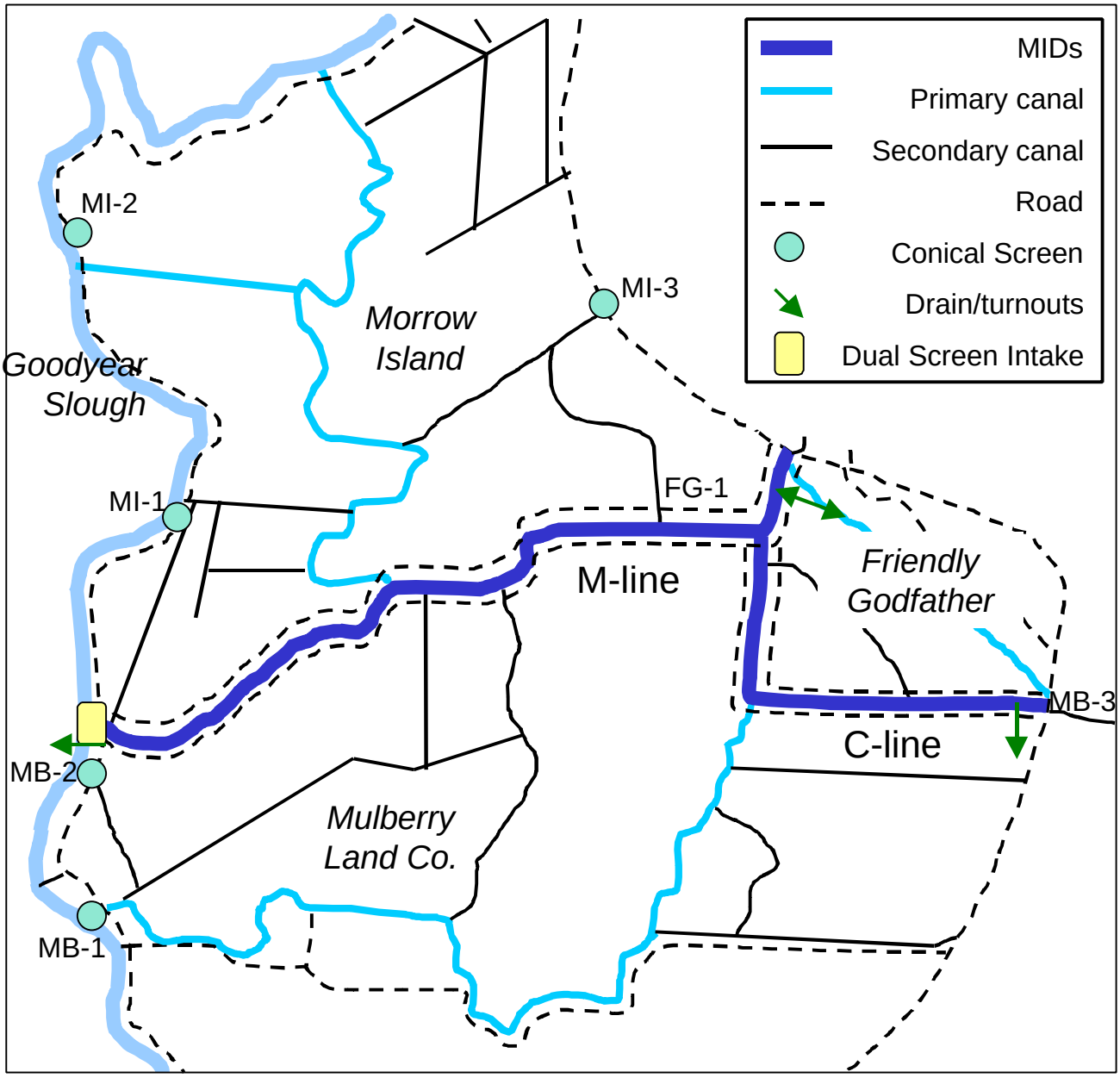

Figure 2 MIDS Hybrid Fish Screen Proposal

Attachment 1
List of Inquiries from Division of Engineering on Morrow Island Fish Screen Project Received August 17, 2000

1. Refer to demonstrated cost advantages of flat plate screen developed for the large diversion and explain why conical screens are now being recommended.

2. Basis for selection of conical screens.

3. Design / flow criteria used to establish 2-conical screen recommendation.

4. Level of construction inspection proposed for State portion of project as well as that contracted out.

5. Level of desired "sole sourcing", i.e., screen only, screen plus hydraulic brush cleaning system, control systems? Mechanical/electrical systems.

6. Why sole sourcing is desired.

Attachment 2
Significant Events since September 1999
MIDS Fish Screen Project
August 2000

1. *October 8, 1999:* DWR & USFWS met to consider fish friendly alternatives to building a large fish screen structure on the MIDS intake. The USFWS would not consider an offsite tidal wetland restoration project, but was open to providing DWR/USBR more time to look at other "fish friendly" alternatives. The USFWS suggested a "flow-through" or open system.

2. *October 22, 1999:* MIDS ECAT members met to discuss how to proceed and decided to: (1) proceed with a feasibility study on other "fish friendly" alternatives, (2) meet with DWR Legal to discuss sole source aspects of the conical fish screen, and (3) if selected, to begin final design in January 2000 on a large intake fish screen, award a contract in fall 2000, and build the screen in summer 2001.

3. *End October 1999 to End January 2000:* Suisun Marsh Branch identified and fleshed out five fish friendly alternatives other than the large intake fish screen (conceptual / preliminary design level). Staff prepared a document summarizing and evaluating pros and cons of all six alternatives.

4. *February 8, 2000:* Suisun Marsh Branch staff presented the six alternatives for/to the MIDS fish screen to members of the Suisun Marsh Preservation Agreement ECAT, which includes representatives from DWR, USBR, DFG, SRCD, USFWS, and SF-USACE. Of the six, DWR staff recommended the alternative of operating the MIDS as a drain-only system with distributed conical fish screens. The SMPA ECAT members, including the USFWS representative, considered the six alternatives fish friendly. It was decided to next meet with the landowners using the MIDS to present the six alternatives.

5. *February 23, 2000:* DWR staff (Suisun Marsh Branch, Delta Field Division, and Land and Right of Way) and SRCD Executive Director met with landowners using MIDS at the Mulberry Clubhouse (#705). DWR staff presented the six alternatives in detail and received feedback. The large fish screen and drain-only/distributed screen alternatives were discussed at length. The landowners expressed a number of concerns about both alternatives that were summarized in an email to all MIDS ECAT members on February 24, 2000 (Attachment 3).

   A significant outcome of the meeting was a *seventh alternative*, which is a hybrid of the small intake screen and distributed screen alternatives. The alternative would use the MIDS as a drain and to provide water only to the Friendly Godfather (#703), and the eastern ponds of the Morrow Club (#702) and Mulberry Club (#705).

6. *March 2000:* Suisun Marsh Branch staff fleshed out the hybrid alternative with input from SRCD and the landowners.

7. *April 5, April 12, May 10, 2000:* ESO staff met with each landowner separately, and twice with the Morrow Club (#702) to work out details of the hybrid alternative, such as possible locations for the distributed conical fish screens, additional turnouts on the MIDS to improve water delivery to the eastern portion of Morrow Island, and the need for joint-operation guidelines for drawing water from the MIDS. Subsequently, all landowners have accepted the hybrid alternative.

8. *April 12, 2000:* DWR staff presented the seven alternatives to the SRCD Board of Directors and noted that implementing the hybrid alternative may involve a DWR contract with SRCD for constructing the distributed conical fish screens on private lands.

9. *May 2000:* Suisun Marsh Branch staff consolidated all features of the hybrid alternative and prepared a conceptual map, list of features, and comparison matrix of the seven alternatives. Land and Right of Way staff prepared the first draft of amendments to existing Right of Way agreements.

10. *June 6, 2000:* MIDS ECAT meets to receive an update on MIDS fish screen project, the seven "fish friendly" alternatives, the recommended hybrid alternative, and to decide on action items and timeline to complete the project by October 2001.

11. *June 7, 2000:* DWR staff met with all landowners and SRCD Executive Director to review features of hybrid alternative, draft joint-operation guidelines, and decide on action items and timeline to complete the project by October 2001.

12. *June 2000:* ESO staff distributed version 1 of Environmental Impacts Analysis for the Proposed MIDS Fish Screen Installation to the MIDS and SMPA ECAT members (includes DWR, USBR, DFG, SRCD, USFWS, NMFS, and USACE).

13. *July 2000:* Staff from Land and Right of Way, Legal, and Suisun Marsh Branch worked on second draft of Right of Way amendments.

14. *August 2000:* ESO staff distributed version 2 of Environmental Impacts Analysis for the Proposed MIDS Fish Screen Installation to the landowners and MIDS and SMPA ECAT members.

15. *August 17, 2000:* O&M, DOE, and ESO members of MIDS ECAT met to coordinate final design and contracting process. DOE requested input for ESO on six inquiries.

16. *August 31, 2000:* ESO distributed memo to Delta Field Division and DOE (1) summarizing the project planning process, stakeholder involvement, peer review, alternative selection process; (2) responding to DOE inquiries; and (3) recommending the Hybrid Alternative and implementation by October 2001.

Kamyar Guivetchi, 12:13 PM 2/24/200, Landowner Meeting on Alternati

X-Sender: kamyarg@cd-eso
X-Mailer: QUALCOMM Windows Eudora Pro Version 4.2.1
Date: Thu, 24 Feb 2000 12:13:58 -0800
To: midsecat@water.ca.gov
From: Kamyar Guivetchi <kamyarg@water.ca.gov>
Subject: Landowner Meeting on Alternatives for MIDS Fish Screen Requirement
Cc: rbrown, cldunn@mp.usbr.gov, Jerry Raasch <jerryr@water.ca.gov>

ECAT Members:

This is an update on the MIDS fish screen project.

On Wednesday, February 23, Diana Garofalo, Mike Floyd, Jerry Raasch, and I met with landowners using the MIDS and Steve Chappell of SRCD to discuss the six alternatives we have considered for meeting the USFWS requirement for preventing fish from entering the MIDS.

We spent most of the time discussing two of the six alternatives, namely constructing a large fish screen structure at the MIDS intake and operating the MIDS as drain-only with distributed conical screens. There was much lively discussion, and if the landowners had their way, they would like things as they are now. They understand, however, that is not an option and that we need to implement an action by October 2001.

Here are some of the landowners' issues:

1. Hepper (Mulberry Club) does not want a large fish screen at the intake. The easterly most portion of the property (Pond C; about 25%) currently gets water from C-Line. There are no existing fill culverts to Suisun Bay. He is concerned that as a drain-only facility, the MIDS would at times have little or no water in it.

2. Scamba's (Friendly Godfather Club) main concern was getting water from the fish screen (large or small) to all sections of his property. He currently fills the highest portion of the property from C-Line.

3. Members of the Morrow Club currently use the MIDS to fill and drain northward to adjacent sloughs. They need more time to consider if/how they could use their existing facilities and ditches to fill from the sloughs and drain into the MIDS (as well as the sloughs). They currently fill two of their eastern portions (Ponds E and F) from M-Line.

Toward the end of the 2.5 hr meeting, a hybrid alternative surfaced that may meet everyone's needs. The concept would be to use the MIDS as a drain **and** to provide water only to the Friendly Godfather, and eastern ponds of the Morrow and Mulberry clubs (about 400 acres). A small fish screen would be needed at the MIDS intake to provide water to that area. Distributed conical screens would be used to provide screened water to the remaining portions of Morrow and Mulberry clubs. The landowners need more time to think through the details.

Another issue was raised that I will need to discuss with the USFWS. The Morrow and Mulberry clubs noted that they are now using other unscreened diversions to supplement the water they get from the MIDS. If we build a large fish screen on the MIDS intake, they would continue using their unscreened diversions, as needed, except during restricted periods, as specified in SRCD's Regional General Permit. If we go to a distributed screen alternative, they want to retain their "supplemental" intake capacity, which at this time would remain unscreened.

I have asked the landowners to let me know by March 6, if they want us to proceed with the drain-only or hybrid alternatives, or if we should proceed to build a large screen at the intake (the fall back alternative). Also, to help the landowners in their decision, SRCD has scheduled for the landowners to visit an existing conical screen (they have not seen one before) on Friday, February 25.

Please contact me if you have questions. I will keep you posted.

Take Care,

Kamyar

Kamyar Guivetchi, Program Manager
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Environmental Services Office
Department of Water Resources
3251 S Street, Room A-15, Sacramento, CA 95816
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Attachment 4

Estimate Design and Construction (Capital) Costs [1]
For Fish Friendly Alternatives
MIDS Fish Screen Project

August 2000

1. Large Centralized Fish Screen Facility - Inclined Flat-Plate Screens (DOE)

Design	$0.45 million
Construction	$1.78
Total	$2.23 million

2. Large Centralized Fish Screen Facility – 6 Conical Screen Array (DOE)

Design	$0.45 million
Construction	$2.20
Total	$2.65 million

3. Smaller Centralized Fish Screen Using Pumps – Inclined Flat Screen

Design	$0.4 million
Construction (65% large facility)	$1.2
Pumps	$0.5
Total	$2.1 million

4. Smaller Centralized Fish Screen Using Pumps – 3 Conical Screen Array

Design	$0.4 million
Construction (65% large facility)	$1.4
Pumps	$0.5
Total	$2.3 million

[1] Except as noted, DWR Suisun Marsh Branch staff prepared capital cost estimates. No cost estimates were prepared for infeasible alternatives, including: (1) ground water development, (2) land purchase, and (3) drain-only system with mobile pumps with screens.

5. Open System With 6 Distributed Conical Screens – Open Culvert Gates

Interior Levee Improvement	$2.5 million
6 Conical Screens ($0.35 million/unit) [2]	$2.1
Total	$4.6 million

6. Open System With 6 Distributed Conical Screens – Open Ends

Interior Levee Conversion to Exterior [3]	$3.3 million
6 Conical Screens ($0.35 million/unit)	$2.1
Total	$5.4 million

7. Drain-Only System with 6 Distributed Conical Screens

6 Conical Screens ($0.35 million/unit) $2.1 million (total)

8. Hybrid Alternative

5 Distributed Conical Screens (SRCD @ $0.35 million/unit)	$1.75 million
Dual Conical Screen on MIDS (DOE @ $0.35 million/unit)	$0.70
3 Culvert pipes with Gates (DOE @ $0.025 million/unit)	$0.075
Total	$2.52 million

[2] Assuming conical fish screens are installed by the Suisun Resource Conservation District under contact with DWR.

[3] Based on DOE per mile cost estimate for converting the Roaring River Distribution System southern levee from interior to exterior specifications (1998).

ATTACHMENT 5

SUISUN RESOURCE CONSERVATION DISTRICT
SUISUN MARSH FISH SCREEN PROJECT
ESTIMATED FACILITY MAINTENANCE BUDGET
September 2000

Annual Budget for Technical Services for 5 Conical Fish Screens on Morrow Island

Item	Quanity	Units	Maintenance Period yrs	Charge Rate $	Annual Budget $
Electrical Support/Trouble Shooting	20	hrs	1	90	1,800
Computer Operations Support	10	hrs	1	90	900
Miscellaneous Engineering Services	10	hrs	1	90	900
Diver Services	8	hrs	1	60	480

ANNUAL BUDGET FOR TECHNICAL SERVICES ON 5 SCREENS = $4,080

Annual Maintenance Budget for Each Line-Powered Conical Fish Screen

Item	Quantity	Units	Maintenance Period yrs	Charge Rate $	Annual Budget $
Screen Cleaning/Removal	12	hrs	1	35	420
Flowmeter/Water Level Indicator Cleaning	6	hrs	1	35	210
Battery Recharge	4	hrs	1	15	60
Johnson Controls 12-volt battery	2	units	5	180	72
Brush Replacement	4	units	5	40	32
Dessicant Materials	6	units	1	1	6
Dessicant Removal/Replacement	12	hrs	1	10	120
General Inspection/Labor	50	hrs	1	20	1,000
Intake Dredging	10	hrs	4	100	250

ANNUAL MAINTENANCE BUDGET PER LINE-POWERED SCREEN = $2,170

Note: PG&E energy cost and technical services are not included.

Annual Maintenance Budget for Each Solar-Powered Conical Fish Screen

Item	Quantity	Units	Maintenance Period yrs	Charge Rate $	Annual Budget $
Screen Cleaning/Removal	12	hrs	1	35	420
Flowmeter/Water Level Indicator Cleaning	6	hrs	1	35	210
Battery Recharge	12	hrs	1	15	180
6-Volt Lead Acid Batteries	12	units	4	100	300
Brush Replacement	4	units	5	40	32
Dessicant Materials	6	units	1	1	6
Dessicant Removal/Replacement	12	hrs	1	10	120
Replacement of Cathodic Protection	2	Units	2	200	100
General Inspection/Labor	50	hrs	1	20	1,000
Intake Dredging	10	hrs	4	100	250

ANNUAL MAINTENANCE BUDGET PER SOLAR-POWERED SCREEN = $2,618

Note: Technical services are not included.

Attachment 6

Conical Fish Screen Patents

US PATENT & TRADEMARK OFFICE
PATENT FULL TEXT AND IMAGE DATABASE

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United States Patent *6,089,790*
Berry, III , et al. **July 18, 2000**

Self-cleaning intake screen

Abstract

A self-cleaning intake screen assembly for preventing debris, fish, and other wildlife from being transferred from a waterway such as a lake or river, which includes a conical support structure, a screen and a screen sweeping assembly. The conical support structure has a circular base, a cap plate, and a plurality of support studs extending therebetween. The screen extends between the base and the cap plate and is affixed to the support studs. The screen sweeping assembly is rotatably mounted to the cap plate for sweeping debris off of the screen. A flow restrictor is disposed inside the conical support structure for restricting water flow through a portion of the screen in order to reduce differences in water flow rates through different portions of the screen.

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Appl. No.: **047236**
Filed: **March 25, 1998**

U.S. Class: **405/127**; 138/41; 210/155; 210/157; 210/158; 210/161; 405/40; 405/42
Intern'l Class: B01D 033/044; B01D 033/056; B01D 033/06; B01D 033/073; B01D 035/02
Field of Search: 405/42,127,39,40 210/154-158,161 138/40,41

References Cited [Referenced By]

578179	Mar., 1897	Wolford	210/415.
628517	Jul., 1899	Bliss et al.	210/415.
969364	Sep., 1910	Grootenhuis	210/354.
1051757	Jan., 1913	Powers	405/42.
1123888	Jan., 1915	Kempf	405/42.
1210759	Jan., 1917	Breddin	210/156.
1348945	Aug., 1920	Hirshstein	210/166.
2013971	Sep., 1935	Raisch	210/107.
2022336	Nov., 1935	Bower	210/157.
2136853	Nov., 1938	Knecht	210/397.
4017394	Apr., 1977	Hensley	210/157.
4874017	Oct., 1989	Hendrickson	138/41.
5032264	Jul., 1991	Geiger	405/127.
5102537	Apr., 1992	Jones	210/162.

Other References

Custom Technology Co., Inc., specification sheet for Self Cleaning Suction Screen, 2 pages.
Claude Laval Corp., product description brochure for Self-Cleaning Pump Intake Screens, 4 pages, revised Apr., 1991.
Declaration of Russell M. Berry, dated Jun. 24, 1998 with figure.

Primary Examiner: Lillis; Eileen Dunn
Assistant Examiner: Mayo; Tara L.
Attorney, Agent or Firm: Limbach & Limbach L.L.P.

Parent Case Text

This is a continuation-in-part of Application No. 08/745,077, filed Nov. 7, 1996, now U.S. Pat. No. 5,851,087.

Claims

1. A self-cleaning intake screen assembly for preventing debris, fish, and other wildlife from being transferred from a waterway, comprising:

a conical support structure having a circular base, a cap plate, and a plurality of support studs extending therebetween;

a screen extending between the base and the cap plate and affixed to the support studs; and

a screen sweeping assembly rotatably mounted to the cap plate for sweeping debris off of the screen;

wherein the screen sweeping assembly includes:

a motor attached to the cap plate, and

a plurality of elongate screen sweepers attached to the motor.

2. The self-cleaning intake screen assembly as recited in claim 1, wherein each of the plurality of elongate screen sweepers is angled rearwardly from a forward direction of travel.

3. A self-cleaning intake screen assembly for preventing debris, fish, and other wildlife from being transferred from a waterway, comprising:

a conical support structure having a circular base, a cap plate, and a plurality of support studs extending therebetween;

a screen extending between the base and the cap plate and affixed to the support studs;

a screen sweeping assembly rotatable mounted to the cap plate for sweeping debris off of the screen, the screen sweeping assembly including a motor attached to the cap plate and a plurality of elongate screen sweepers attached to the motor; and

a brush cleaner extending between the circular base and the cap plate, and protruding above the screen for periodic engagement with the screen sweepers.

4. A self-cleaning intake screen assembly for preventing debris, fish, and other wildlife from being transferred from a waterway, comprising:

a conical support structure having a circular base, a cap plate, and a plurality of support studs extending therebetween;

a screen extending between the base and the cap plate and affixed to the support studs;

a screen sweeping assembly rotatably mounted to the cap plate for sweeping debris off of the screen; and

a flow restrictor disposed inside the conical support structure for restricting water flow through a portion of the screen in order to reduce differences in water flow rates through different portions of the screen.

5. The self-cleaning intake screen assembly as recited in claim 1, wherein the flow restrictor is a disk shaped member disposed between the cap plate and the circular base.

6. The self-cleaning intake screen assembly as recited in claim 5, wherein the disk shaped member is adjustably supported between the cap plate and the circular base so that a distance between the disk shaped member and the circular base is selectively adjustable.

7. The self-cleaning intake screen assembly as recited in claim 4, wherein the flow restrictor is a conical shaped member having an apex end terminating in a first hole that faces the circular base and a base end terminating in a second hole that faces the cap plate.

8. The self-cleaning intake screen assembly as recited in claim 7, wherein the conical shaped member is adjustably supported between the cap plate and the circular base so that a distance between the conical member and the circular base is selectively adjustable.

9. The self-cleaning intake screen assembly as recited in claim 4, wherein the flow restrictor is a pair of overlapping first and second cone members, the first cone member having a first plurality of holes formed therein and the second cone member having a second plurality of holes formed therein, the first cone being rotatable relative to the second cone member to adjust an amount of overlap between the first and second pluralities of holes.

Description

FIELD OF THE INVENTION

This invention relates to intake screens to exclude fish and debris from entering a water inlet, and is particularly directed to a self-cleaning intake screen.

BACKGROUND OF THE INVENTION

Self-cleaning intake screens are well known in the art. The earliest of such devices simply employed some mechanism to cause the screen, generally cylindrical in shape, to rotate within the stream or waterway. As the screen rotated, any debris trapped on its upstream side would be washed away as it turned downstream. More sophisticated devices employ some sort of backwash system which, either continually or at periodic intervals, spray a high pressure jet of water or air against the inside of the screen in an attempt to blow debris off of and away from the screen. However, most self-cleaning intake screen designs are complicated and/or do not effectively keep the screen free from debris.

Further, for many applications of intake screens, there is a maximum flow rate per unit area of screen that cannot be exceeded in order to protect fish and other wild life that are in the water passing through the intake screen. Simply making the screen larger to reduce the per unit area flow rate is ineffective since the water tends to flow through the central portion of the screen.

There is a need for an intake screen that reliably and effectively cleans itself, as well as minimizes the maximum water flow rate passing through the screen.

SUMMARY OF THE INVENTION

The present invention solves the aforementioned problems by providing an intakes screen assembly that efficiently and effectively cleans itself, while also minimizing the difference in flow rates through different portions of the screen.

In one aspect of the present invention, a self-cleaning intake screen assembly for preventing debris, fish, and other wildlife from being transferred from a waterway such as a lake or river, includes a conical support structure, a screen and a screen sweeping assembly. The conical support structure has a circular base, a cap plate, and a plurality of support studs extending therebetween. The screen extends between the base and the cap plate and is affixed to the support studs. The screen sweeping assembly is rotatably mounted to the cap plate for sweeping debris off of the screen.

In another aspect of the present invention, a flow restrictor is disposed inside the conical support structure for restricting water flow through a portion of the screen in order to reduce differences in water flow rates through different portions of the screen.

Other objects and features of the present invention will become apparent by a review of the specification, claims and appended figures.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of the invention in place in a waterway and providing filtered water through a levee to a commercial utility or agricultural canal;

FIG. 2 is a side view in partial section of that shown in FIG. 1;

FIG. 3 is a side elevational view of the invention;

FIG. 4 is a top plan view of the invention;

FIG. 5A is a perspective view of the conical support structure of the invention, one screen section, and

the brush cleaner;

FIG. 5B is a sectional view of the brush cleaner taken along line 5B--5B of FIG. 5A;

FIG. 6 is an exploded view of the screen sweeping assembly of the invention;

FIG. 7 is a side view, in partial section, of the drive mechanism and screen sweepers of the invention;

FIG. 8 is a top plan view of a base and outlet pipe for the invention;

FIG. 9 is a side view, in partial section, showing the invention resting on the base of FIG. 8;

FIG. 10 is a side view, in partial section, of a screen sweeper;

FIG. 11 is a sectional view of a screen sweeper taken along line 11-11 of FIG. 10;

FIG. 12 depicts the installation of a series of second embodiments of the invention;

FIG. 13 is a perspective view of the second embodiment in place in a concrete embankment; and

FIG. 14 is a side sectional view of the second embodiment in use.

FIG. 15A is a partial fragmentary side view of the invention including a flow restrictor;

FIG. 15B is a top view of the flow restrictor of FIG. 15A with a center hole;

FIG. 15C is a top view of the flow restrictor of FIG. 15A with perforated holes;

FIG. 16 is a side view of the invention including an alternate embodiment of the flow restrictor;

FIG. 17A is a side view of the invention including a second alternate embodiment of the flow restrictor;

FIG. 17B is a top view of the first cone member of the second alternate embodiment of the flow restrictor;

FIG. 17C is a top view of the second cone member of the second alternate embodiment of the flow restrictor.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings, wherein like reference numerals designate identical or corresponding parts throughout the several views, FIG. 1 and FIG. 2 show the self-cleaning intake screen assembly of the present invention depicted generally at 10 where it is submerged within a waterway 12 to provide filtered water through a pipe 14 which runs through a levee 16 to a canal 18 or pipe for further distribution. The water level in the canal is monitored by a controller 20 which raises and lowers a gate 22 to adjust the water flow. Such devices are often powered by a solar panel 24 for operation in remote areas.

Referring now primarily to FIGS. 3, 4, and 5A, the self-cleaning intake screen assembly 10 is preferably fabricated from stainless steel and is seen to comprise a circular, inverted L-shaped base 26 with a series of legs 28 welded to its interior surface and extending downward and inwardly therefrom. Welded to and extending upward and inward at a 35 degree angle from the circular base 26 is a series of spaced studs 30 which are welded to and support a circular cap plate 32. For additional support, the circular base 26 has a series of five spokes 34 extending from a central hub 36 and welded to the interior of the circular base 26. These spokes 34 support a series of upwardly angled tubes 38, which in turn support a stud support ring 40, welded to the lower side of the studs 30, and the cap plate 32. Also extending between the circular base 26 and the cap plate 32 is a brush cleaner 42. Referring also to FIG. 5B, the brush

cleaner 42 is seen to comprise an elongate, U-shaped member 44 with an elongate cleaning brush 46 secured therein and extending upward therefrom. The cleaning brush 46 is secured within the U-shaped member 44 by means of a plurality of brush holders 48. The brush holders 48 are familiar to those in the art and are simply clamps which are bolted within the U-shaped member 44 and then closed over the channel of the brush 46.

Secured to the outer edges of the studs 30, preferably by riveting, is a plurality of perforated plate sections 50 which extend between the cap plate 32 and the circular base 26 to form a conical intake screen 52 as depicted in FIGS. 3 and 4. The perforated plate preferably has a hole diameter of from 3/32inch to 1/4inch. Also depicted in FIGS. 3 and 4 is the brush cleaner 42, with the bristles of the cleaning brush 46 extending approximately 1/4inch above the surface of the intake screen 52 through a gap left between adjacent perforated plate sections 50 which are riveted to the edges of the U-shaped member 44. The cleaning brush 46, the function of which will be described below, preferably has 0.060 inch diameter nylon bristles.

Referring now primarily to FIGS. 6 and 7, the screen sweeping assembly 60 is seen to include a motor 62, a reinforcement plate 64, and a motor plate 66, the three of which are attached together by bolts (not shown) and then secured to the cap plate 32 (FIGS. 5A) by bolts (also not shown). The preferred motor 62 is a submersible, high torque, low speed gear reduction motor with programmable operating modes available from Empire Magnetics, Inc. The sweeping assembly 60 also includes a sweeper hub 68 having a central motor attachment hub 70 with four extensions 72, each having a pair of hinge knuckles 74 for cooperation with a complimentary pair of hinge knuckles 76 affixed by gussets 54 to the inner end of the screen sweepers 82. The two pairs of hinge knuckles 74, 76 are connected by a double knuckle 78 and two hinge pins 80 to provide a double pin hinge for increased flexibility in the pivot joint.

Referring also to FIGS. 10 and 11, the screen sweepers 82 are comprised of an elongate tube 84 with an approximately 15 degree clockwise bend adjacent their inner end. The tube 84 has a series of brush-holder access holes 86 along its upper side to permit installation of a series of brush holders 48 within holes in the lower side of the tube 84. Each brush holder 48 has a stud 58 and is secured to the tube 84 by means of a pair of nuts 56. The brush holders 48 in turn are clamped to a sweeper brush 88 which then extends along the lower length of the brush holder 48 for contact with the conical intake screen 52. The sweeper brush 88 preferably has nylon bristles 0.045 inch in diameter.

Also shown in FIG. 7 is one of four lifting lugs 90 which are secured around the circumference of the motor plate 66 to permit the invention to be lifted by a crane for installation in a waterway. The lifting lugs 90 include a pair of bolts 92 having a cross-member 94 secured between them, and which are attached to the motor plate 66 and the cap plate 32. The cross-member 94 carries a lifting ring 96 which moves freely on the cross-member 94 for attachment to a crane hook.

Referring now to FIGS. 8 and 9, a typical installation of a first embodiment of the self-cleaning intake screen assembly 10 is depicted in a circular fiberglass or concrete tank 100 having an intake pipe 102. As seen in FIG. 9, the self-cleaning intake screen assembly 10 is placed on top of the tank 100 with the circular base 26 resting on the upper edge of the tank for structural support, whereby only filtered water may enter the tank 100 and be carried away by intake pipe 102. The input end 104 of intake pipe 102 is positioned directly underneath central hub 36 to draw water in from the bottom center of the self-cleaning intake screen assembly 10.

A second embodiment of the invention is shown in FIGS. 12, 13, and 14. One or more of the self-cleaning intake screen assemblies 10 are placed in a concrete embankment 110 along a waterway 12 and filter the water as it passes horizontally through the intake screens and into a canal, pumping bay, or other water storage facility. The conical screens 52 of this embodiment utilize a much lower angle of approximately three degrees instead of the 35 degree slope of the first embodiment. The only other primary difference is that the screen sweepers 82 are spring loaded for engagement with the screen 52 and utilize a gauge wheel on the outer end of the screen sweeper to prevent flattening or excessive bending of the brush bristles.

It has been discovered that when the input end 104 of intake pipe 102 is centrally disposed underneath

the self-cleaning intake screen 10, and the screen diameter is significantly larger than the diameter of the input end 104 of intake pipe 102, there is an uneven rate of water flow through the conical intake screen 52. Specifically, water flow through the upper portion 106 of screen 52 near cap plate 32 can be significantly greater than water flow through the lower portion 108 of screen 52 near the base 26. Uneven flow is a problem for applications where the water flow rate at any point along screen 52 cannot exceed a predetermined limit, for example to protect fish or other wildlife present in the waterway, levee or canal. The large flow rate through the upper portion of screen 52 near the cap plate may place an undesirably low limit on how much water can flow through the self-cleaning intake screen assembly 10.

To minimize water flow rate variations along screen 52, a flow restrictor 120 is placed inside the self-cleaning intake screen assembly 10. Flow restrictor 120 restricts the amount of water flowing down through the central portion of the self-cleaning intake screen assembly 10, which corresponds to the water flowing through the upper portion 106 of screen 52 near the cap plate 32. FIGS. 15A-C, 16 and 17 illustrate three different examples of restrictor 120. In FIGS. 15A-C, restrictor 120 is a disk shaped member 122 centrally disposed inside self-cleaning intake screen assembly 10 and above input end 104 of intake pipe 102. Disk member 122 can be solid, or have a central hole 124 to allow some water flow therethrough (FIG. 15B), and/or be perforated with many small holes 126 (FIG. 15C). The size and number of holes 124/126, along with the diameter of disk member 122 and how far above inlet end 104 it is disposed, is selected to provide the desired flow rate through upper portion 106 of screen 52 in order to minimize the difference in flow rates through the various portions of screen 52. The position of the disk 122 may be made to be adjustable, so the operator can change the distance between disk 122 and the intake pipe 102 during operation in order to fine tune and even out the water flow rates through different portions of screen 52.

It has also been discovered that significant turbulence may exist in water near the inlet end 104. The turbulence is caused by water that flows horizontally near base 26 and passes over the edge of input end 104. Therefore, an annular flow fender 105 is formed around the circumference of input end 104 of intake pipe 102 to minimize such turbulence, as best illustrated in FIG. 15A. The flow fender 105 includes sloping portions 112 and 114 so that horizontally flowing water near input end 104 is not suddenly redirected vertically.

FIG. 16 illustrates an alternate embodiment of flow restrictor 120, which is formed by an inverted conical member 128 centrally disposed inside self-cleaning intake screen assembly 10. The apex end 129 of conical member 128 terminates in an opening 130, which is positioned above input end 104 of intake pipe 102, and the base end 131 of conical member 128 terminates in an opening 132 that faces the cap plate 32. Opening 132 collects water flowing through the upper portion of screen 52 near cap plate 32. The height and position of conical member 128, and the diameters of openings 130/132 dictate the restriction in the water flow from the upper portion of screen 52 near cap plate 32. The position of the conical member 128 may be made to be adjustable, so the operator can change the distance between conical member 128 and the intake pipe 102 in order to fine tune and even out the water flow rates through different portions of screen 52. FIGS. 17A-C illustrate a third alternate embodiment of flow restrictor 120, which is formed by two inverted and overlapping cone members 134 and 136, each having wedge shaped holes 138 near their respective apexes. The apex of cone member 136 is positioned directly above input end 104 of intake pipe 102, and the large opening 132 of cone member 134 faces the cap plate 32 for collecting water flowing through the upper portion of screen 52. Cone member 136 is positioned over the apex of cone member 134, in a rotatable manner, so that the amount of overlap of the wedge shaped holes 138 of the cone member 134 and the wedge shaped holes 138 of cone member 136 can be selectively changed. By rotating cone member 136 relative to cone member 134, the amount of flow through cone members 134/136 can be adjusted to fine tune and even out the water flow rates through different portions of screen 52.

OPERATION

The motor of the invention will typically operate at one revolution per minute, in a programmable sequence of directions and times as necessary for the amount of debris encountered in the waterway. One exemplary program might involve three counterclockwise revolutions (the forward direction), followed by one clockwise revolution, every hour. Another program, for example, involves making three

counterclockwise revolutions, one clockwise revolution, and then stop for a selectable interval of from 15 minutes to 3 hours, although continuous cleaning is also an option. As the screen sweepers moves across the screen, they gather debris that has collected on the screen surface, pushing some ahead of the brush bristles and breaking up some of the material, allowing it to pass through the screen. The device may further be solar powered so it can operate unattended for extended periods in remote areas.

The conical shape of the intake screen exploits the force of gravity to drive the debris down the sides of the cone when the invention is placed in the waterway with the axis of the conical screen oriented vertically. Further, the fact that the screen sweepers are angled rearwardly of the sweeping direction tends to work the debris down the sides of the cone and off the lower edge of the screen. When the screen sweeper encounters the brush cleaner, the smaller diameter bristles of the sweeper brush pass through the bristles of the cleaning brush, allowing debris and algae to be raked out of the sweeper brush and carried away by flowing water.

It is to be understood that the present invention is not limited to the embodiments described above and illustrated herein, but encompasses any and all variations falling within the scope of the appended claims. For example, while four screen sweepers are shown in the figures, as few as one sweeper can be used to keep screen 52 clean, depending on the amount of debris in the water passing through screen 52. Further, wedge shaped holes 138 could instead have other non-wedge shapes.

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Images
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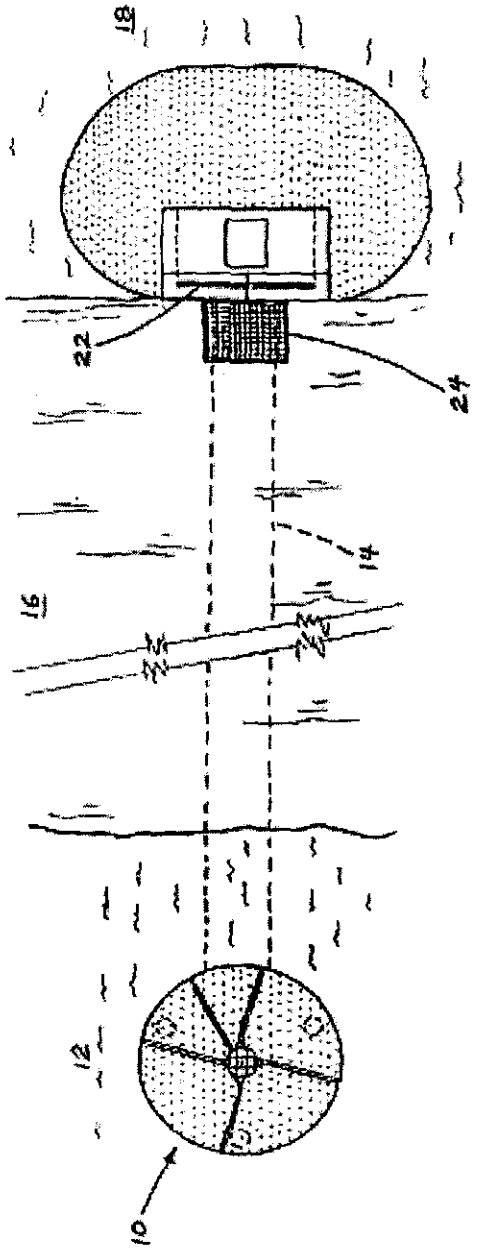

FIG. 1

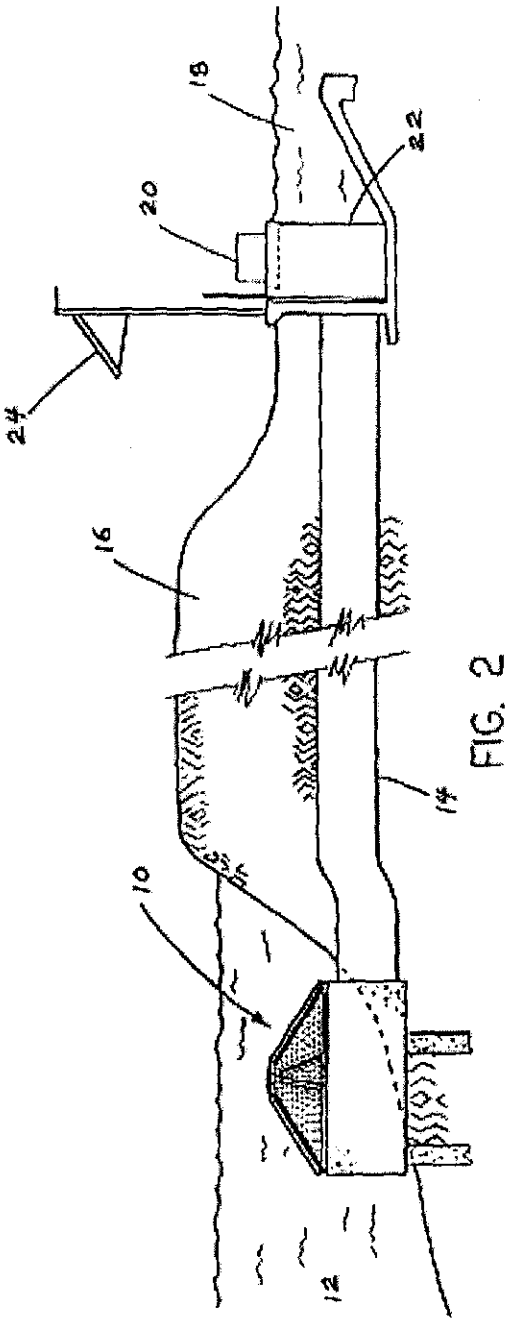

FIG. 2

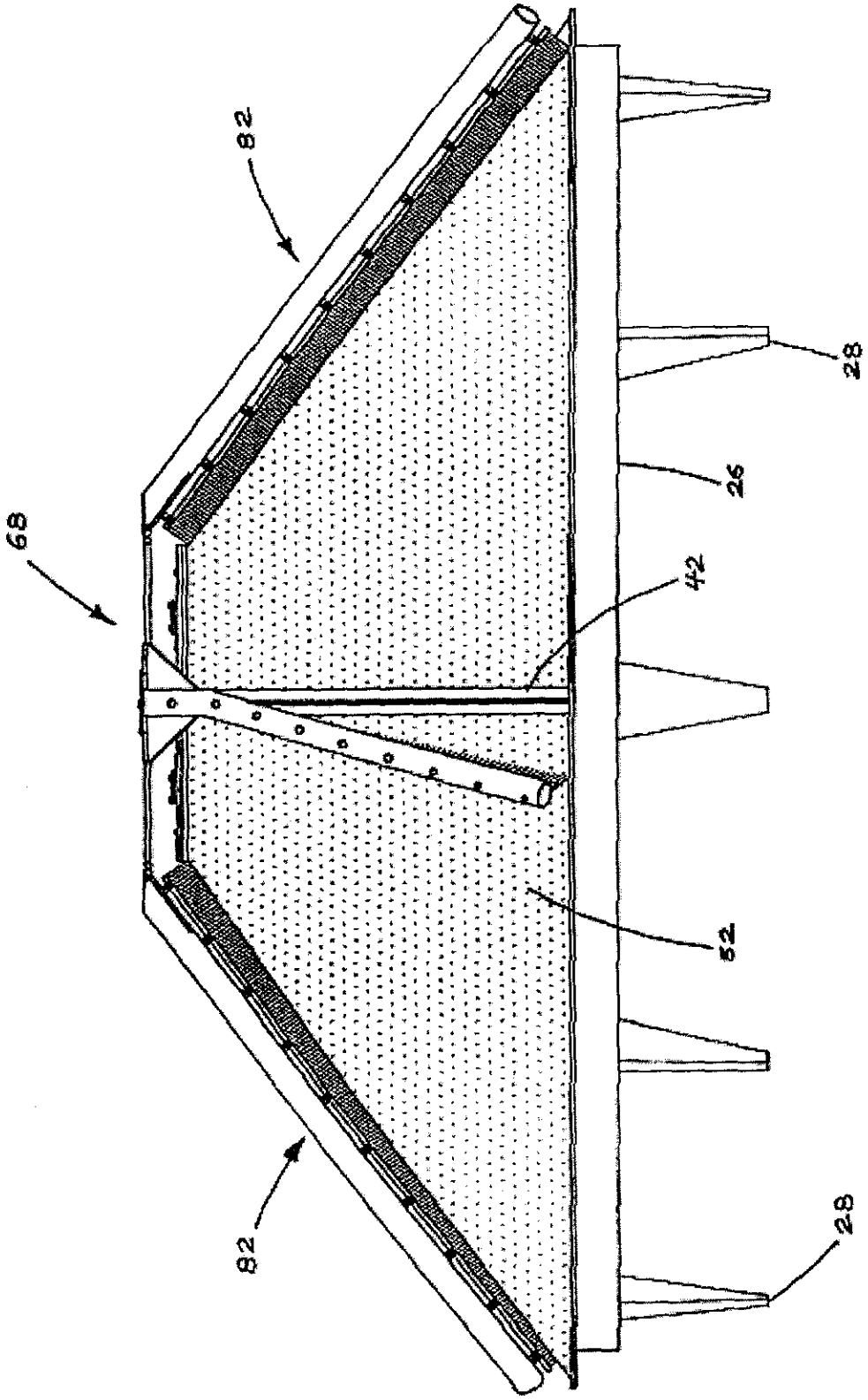

FIG. 3

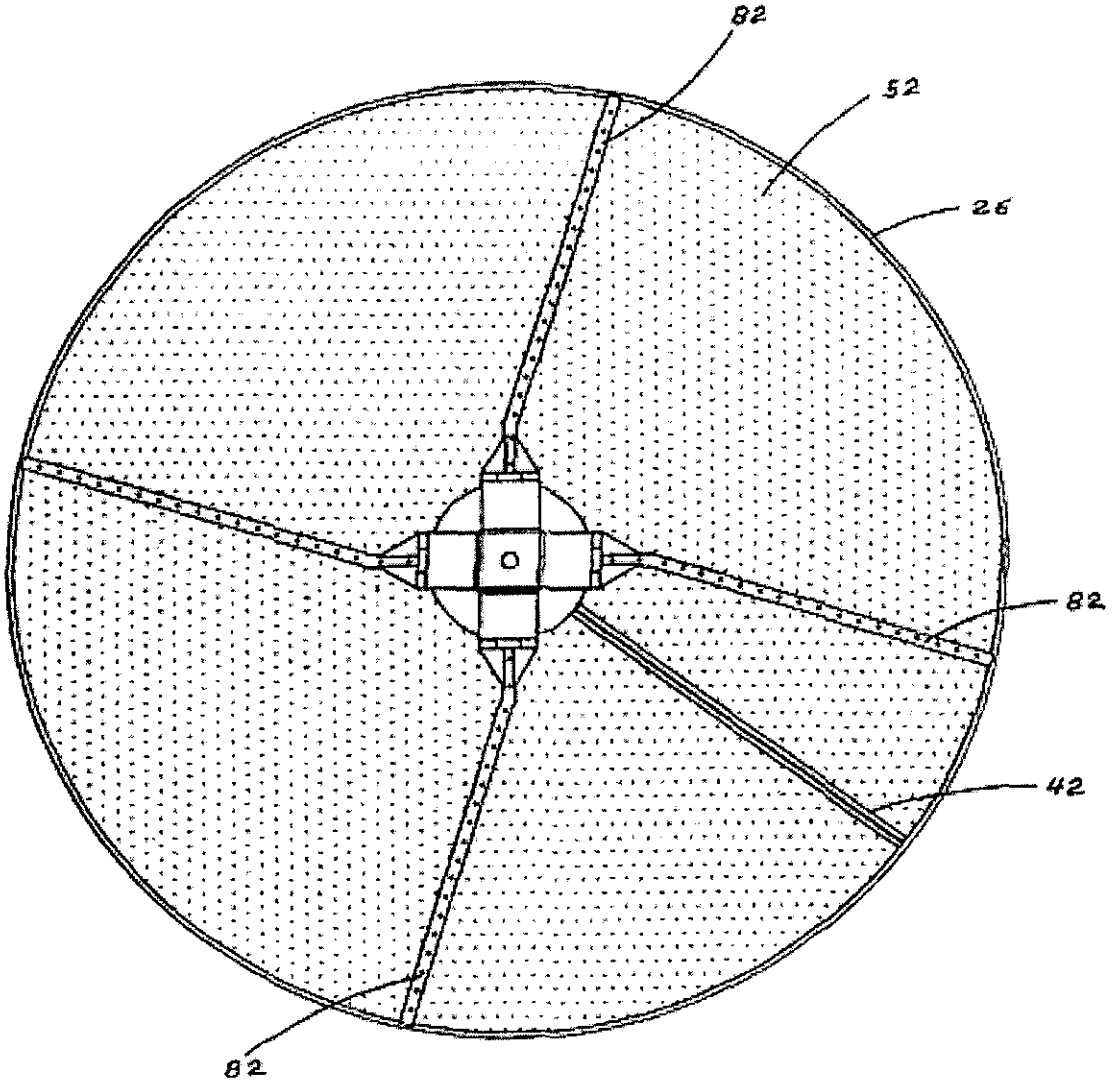

FIG. 4

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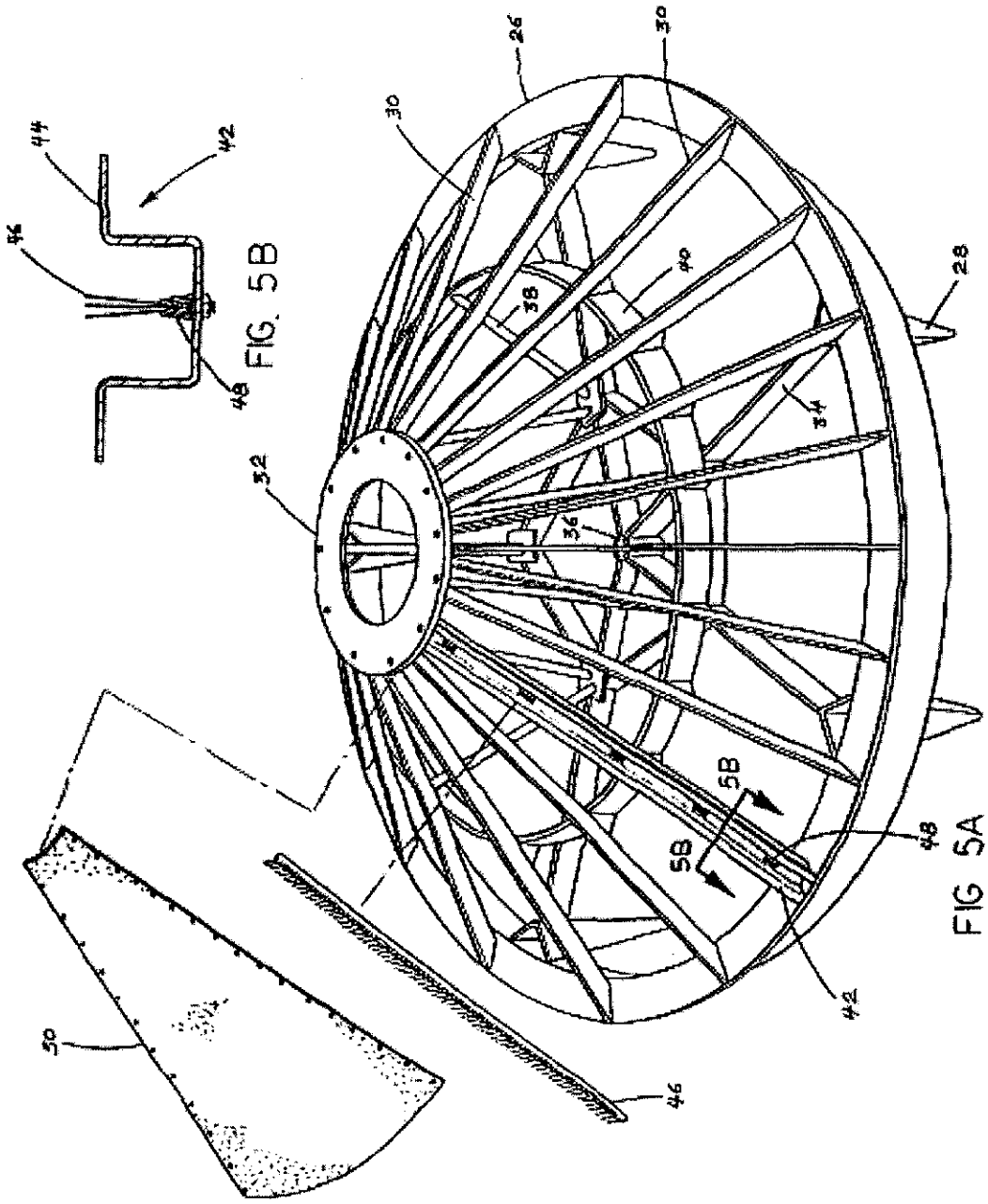


FIG. 5B

FIG 5A

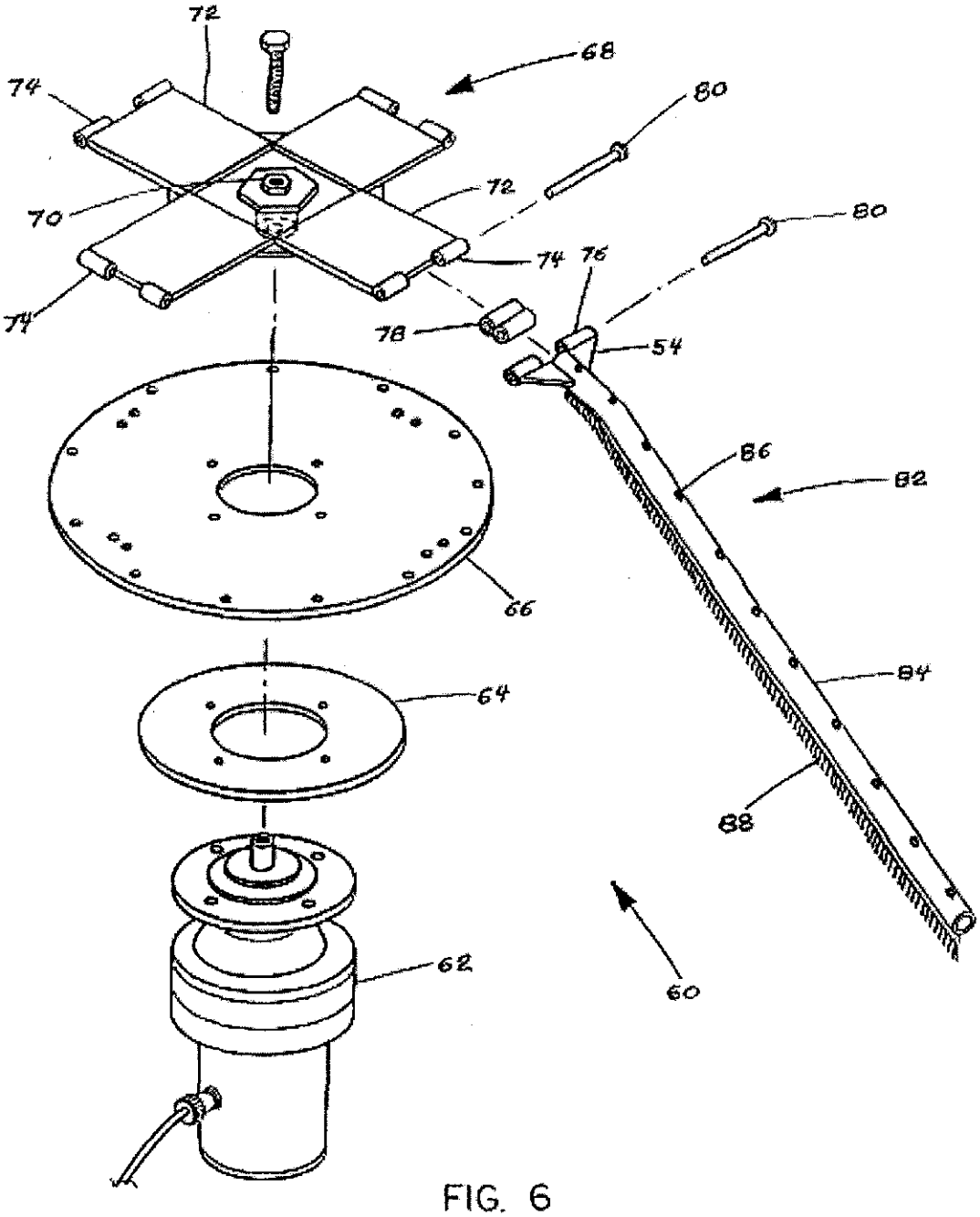


FIG. 6

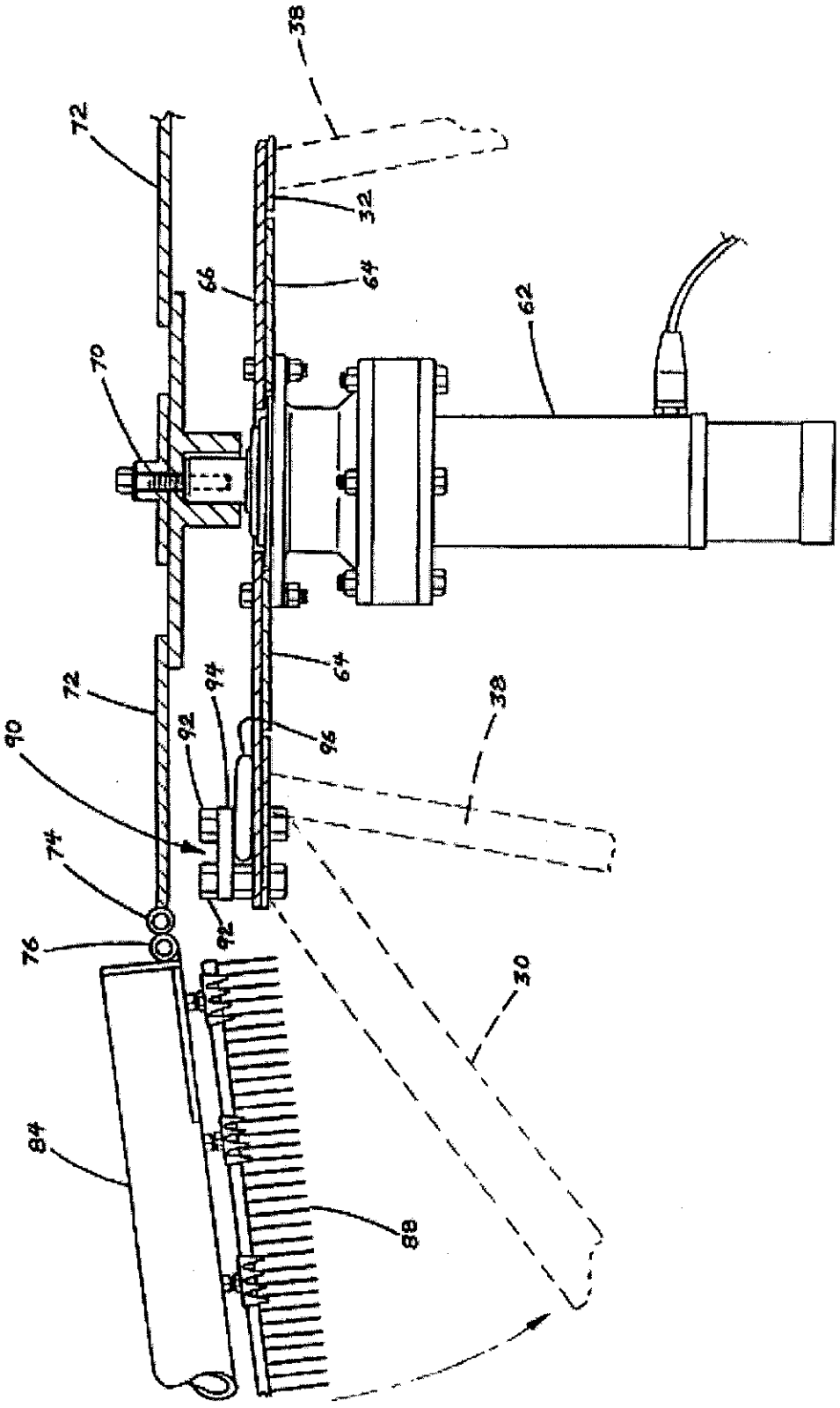


FIG. 7

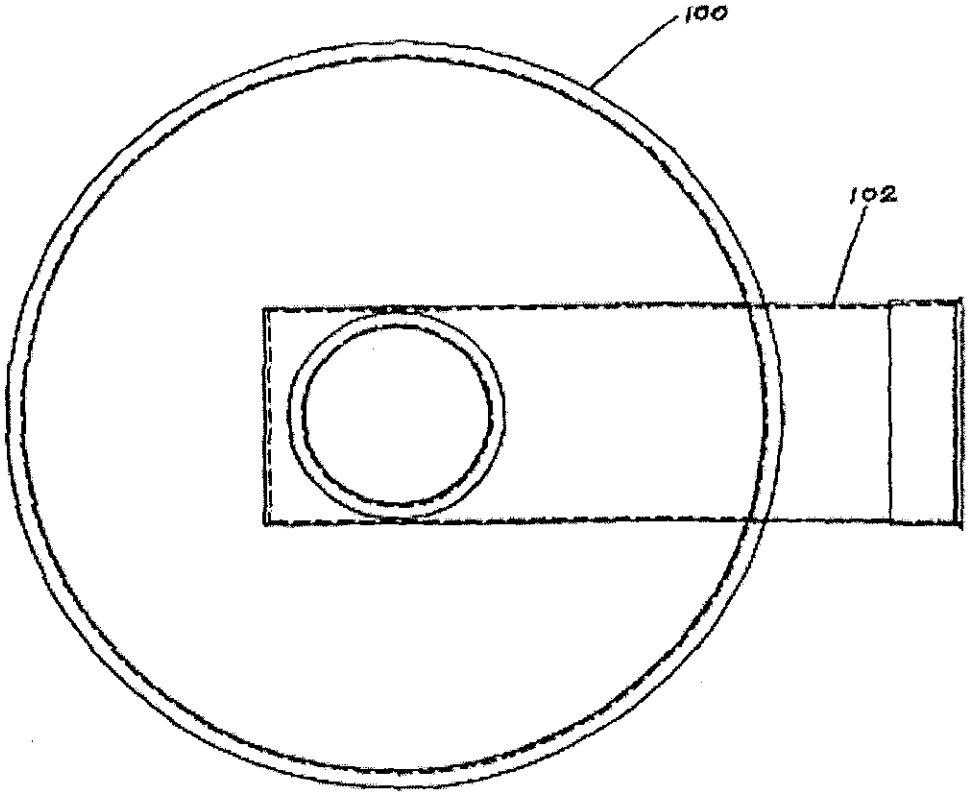


FIG. 8

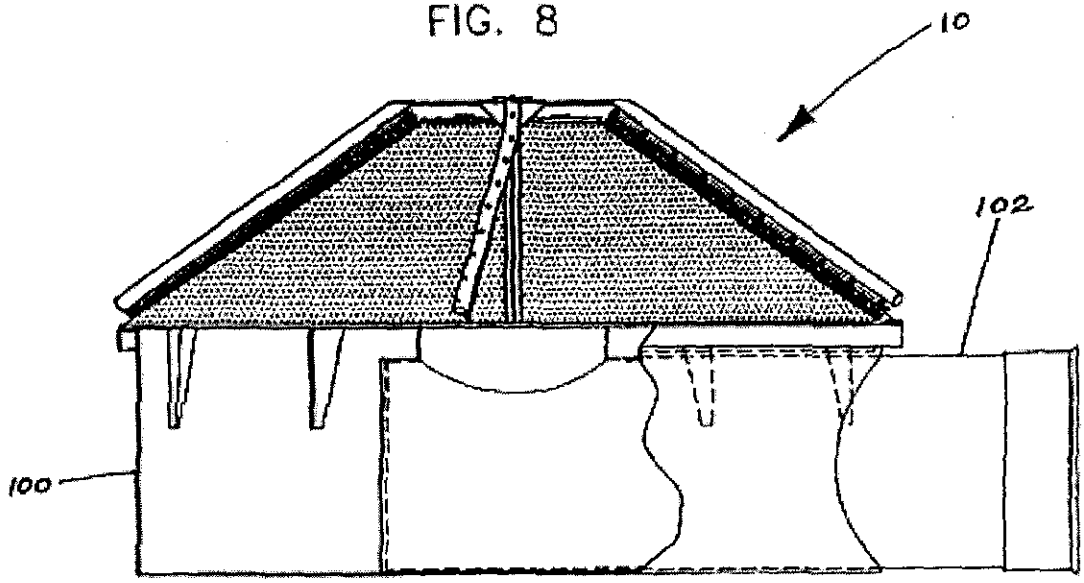


FIG. 9

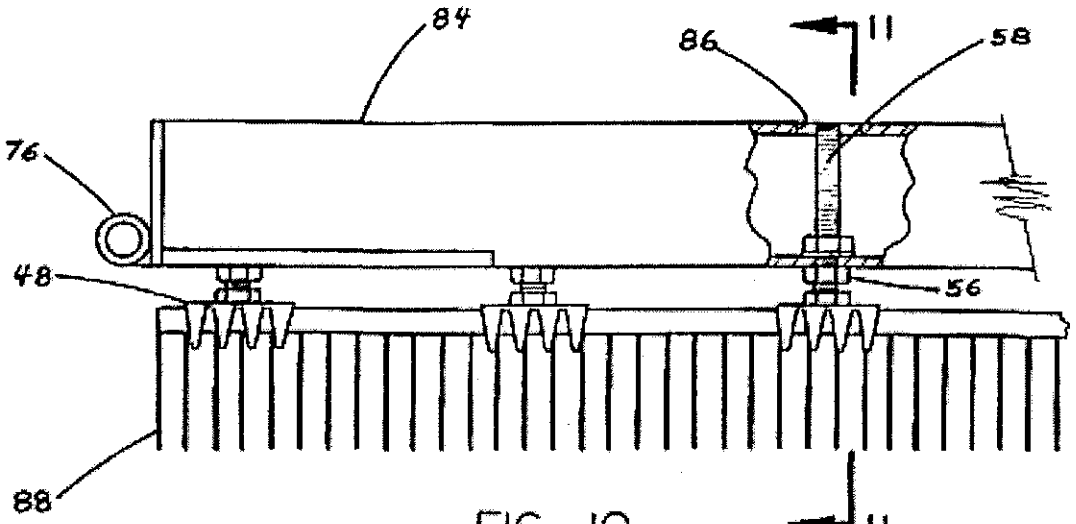


FIG. 10

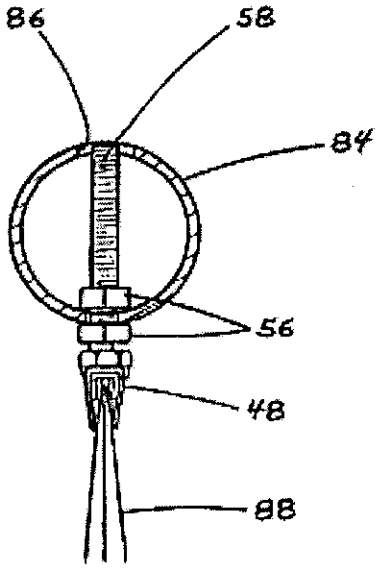


FIG. 11

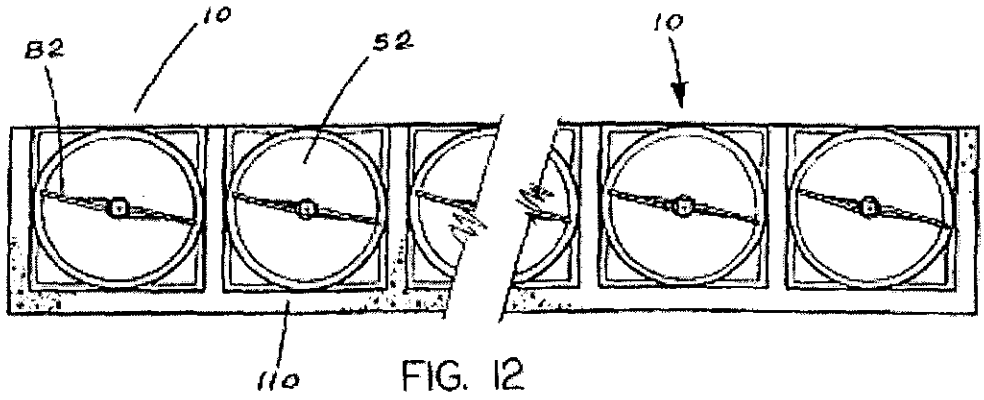


FIG. 12

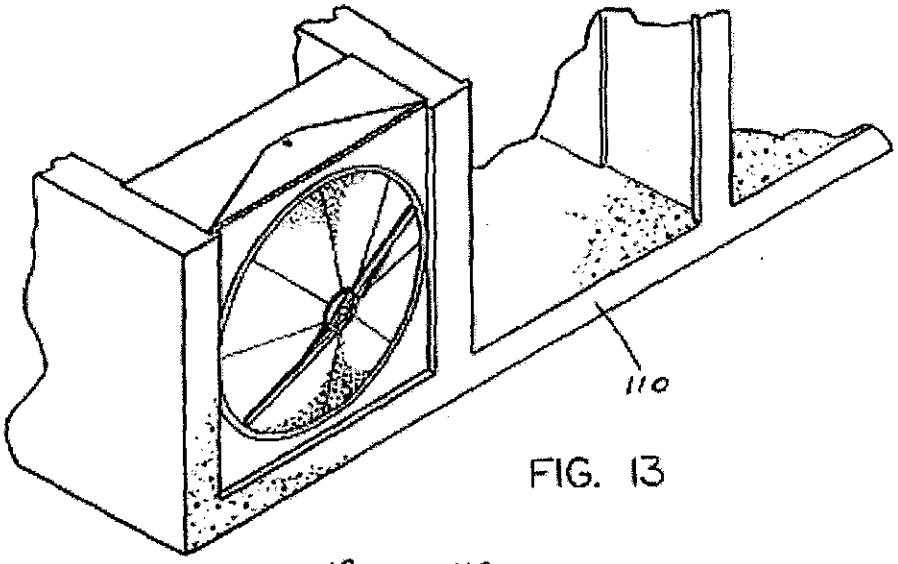


FIG. 13

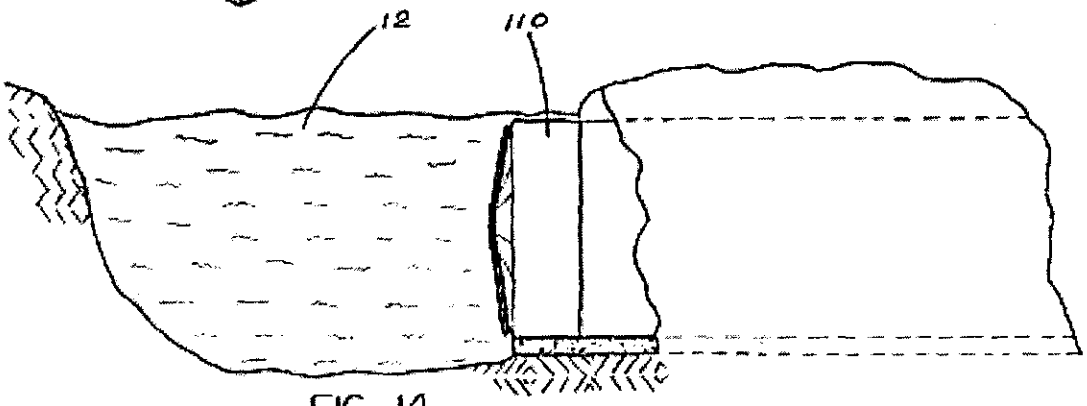


FIG. 14

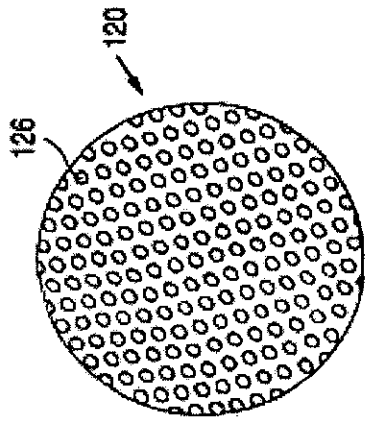


FIG. 15C

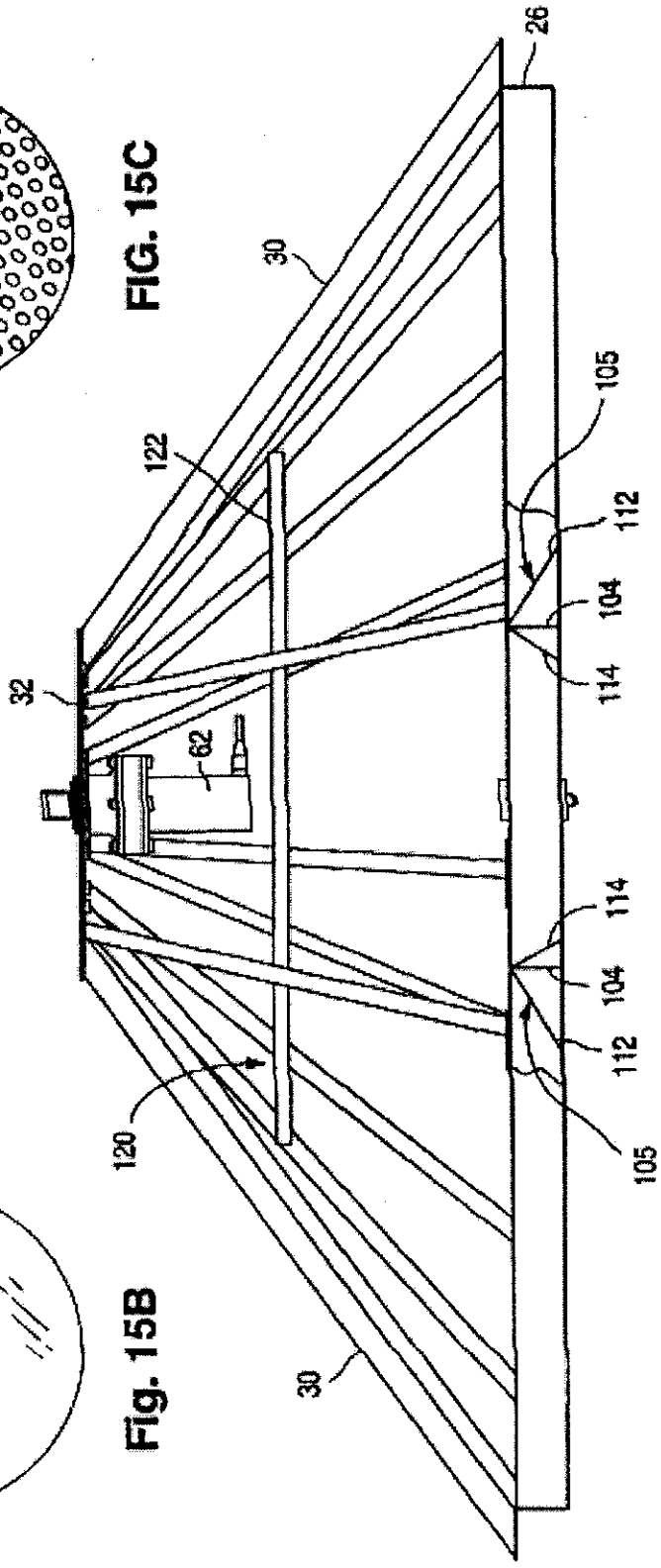


FIG. 15A

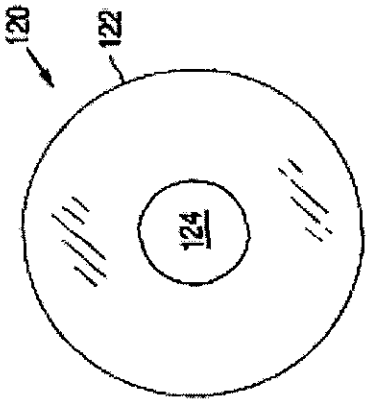


Fig. 15B

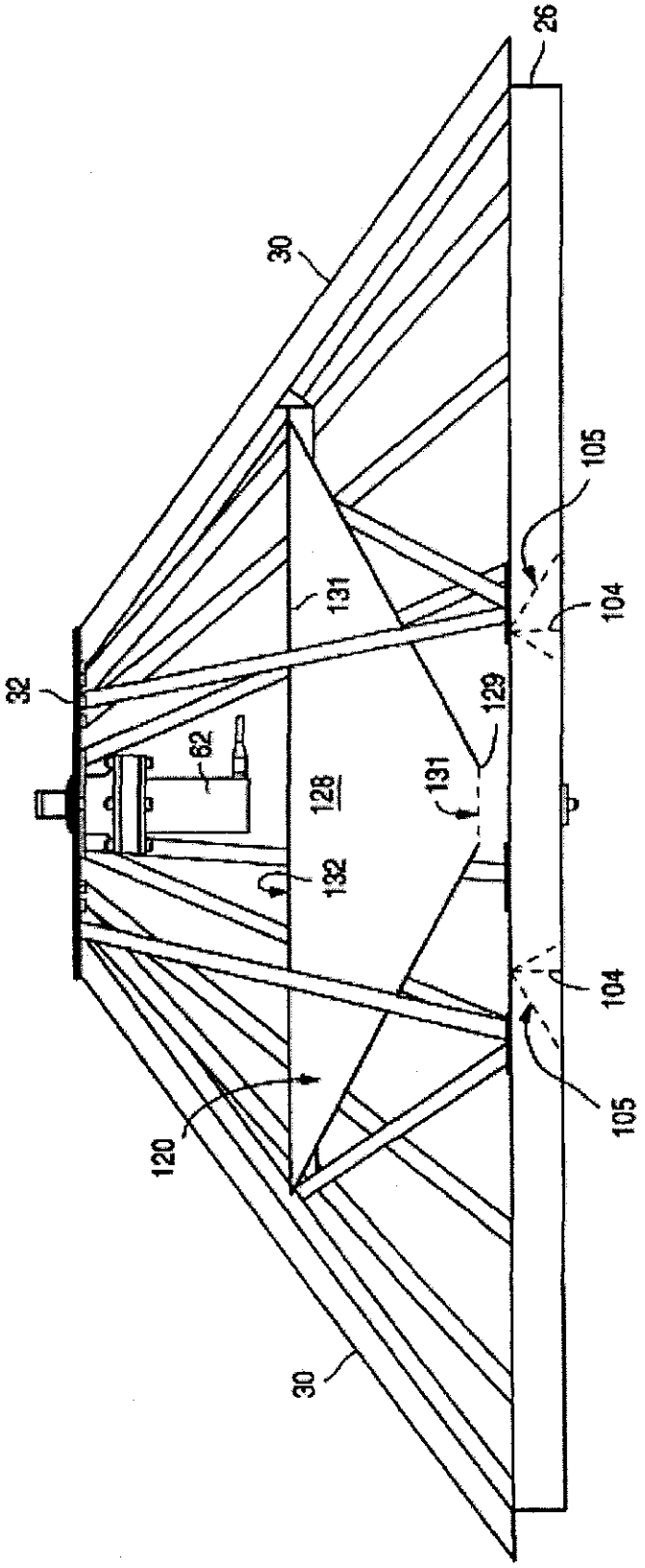
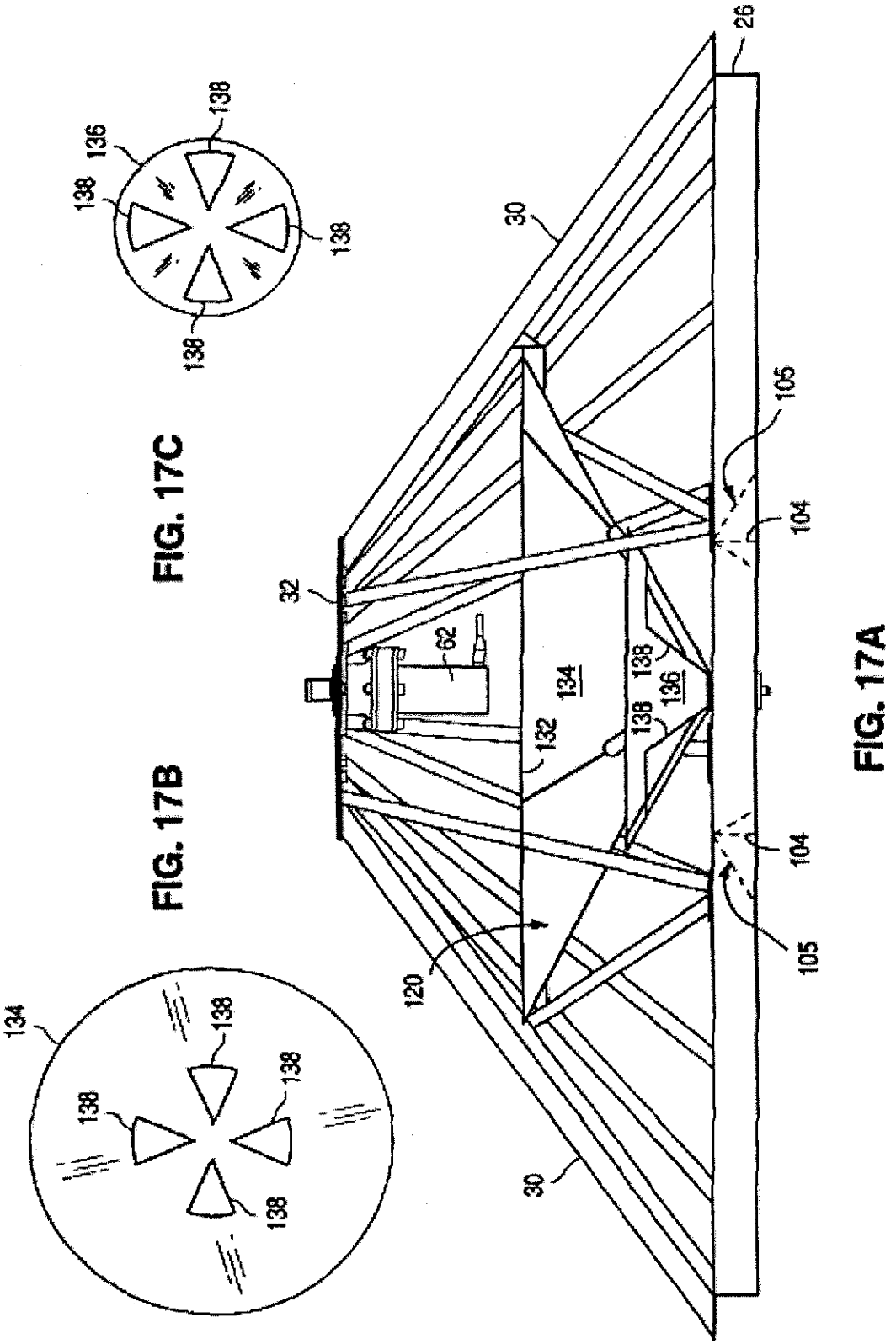


FIG. 16


26
30
105
104
32
62
134
138
136
132
120
FIG. 17A
FIG. 17B
FIG. 17C

(Attachment 7)

--DRAFT—
REQUEST FOR PROPOSAL
FOR
MORROW ISLAND FISH SCREEN PROJECT
(August 31, 2000)

INTRODUCTION

A proposal is requested for the design, permitting, construction, operations support, operations monitoring, routine maintenance, and routine repair of 5 fish screens associated with the Morrow Island Distribution System in the Suisun Marsh.

BACKGROUND

The Morrow Island Distribution System (MIDS) is located in the western Suisun Marsh, as illustrated in Figure 1. The MIDS consists of two hydraulically connected ditches and extends eastward from Goodyear Slough to Suisun Slough and Grizzly Bay, as shown in Figure 2. The system includes an intake structure on Goodyear Slough and two outfall structures. One outfall structure is at the end of M-Line (Suisun Slough). The other outfall is at the end of C-Line (Grizzly Bay).

The U.S. Army Corps of Engineers (USACE) issued Permit No. 20698N, July 2, 1997, for maintenance of the MIDS. Permit conditions require installation of a fish screen on the intake to the MIDS at Goodyear Slough. The Department of Water Resources (Department) and the United States Bureau of Reclamation developed a plan for screening the MIDS after consultation with the U.S. Fish and Wildlife Service and USCOE. The plan consists of the following:

- 2, 12-foot conical screens and 1, 48-inch drain at the MIDS intake;
- 5, 12-foot conical screens distributed along Goodyear and Suisun Sloughs;
- addition of 1, 36-inch turnout along C-line of the MIDS;
- addition of 1, 36-inch combination turnout and drain along M-line of the MIDS; and
- new operations agreement for the MIDS.

The two conical screens to be installed at the MIDS intake will supply screened water through the MIDS to a portion of the Morrow Island Land Company (MILCO) property, a portion of the Mulberry Land Company (MLC) property, and the entire Friendly Godfather (FG) property. The 5 remaining conical screens will be installed at various locations along Goodyear Slough and Suisun Slough to provide screened water directly to portions of the MILCO and MLC properties without the water passing through the MIDS. The proposed locations of all of the conical screens are illustrated in Figure 3.

The total volume of screened flow to be provided by the 7 planned screens approximately equals the volume of flow that would have otherwise been provided by a single, centralized screen facility at the MIDS intake. The use of five of the seven planned screens to provide water directly to the MILCO and MLC properties offers several advantages over installing the entire screen capacity at the MIDS intake. These advantages include reduced sedimentation of the MIDS; increased operational flexibility for managed wetlands, and reduced temporary (construction) and permanent environmental impacts.

Additional information concerning the rational and justification for the proposed screens, as well as a general description of screen construction activities, is contained in the attached report “Environmental Impacts Analysis for the Proposed Morrow Island Distribution System Fish Screen Installation, August 2000.”

PROJECT DEFINITION

The “Project”, for the purposes of this RFP, is the design, permitting, construction, operations support, operations monitoring, routine maintenance, and routine repair of the 5 conical fish screens not connected to the MIDS.

DESIGN

The proposal shall specify measures and resources necessary for the design of the fish screens, including any field surveys that may be necessary to support design efforts. Each screen shall meet the following criteria, as specified in the USACE permit:

1. Maximum approach velocity of 0.2 feet per second measured at a distance of 3 inches “upstream” of the screen face.
2. Maximum mesh opening no larger than 3/32-inch for rectangular wedge wire or 5/32-inch for perforated or woven mesh materials; and,
3. No entrainment of fish larger than one-inch in length.

Each fish screen and screen facility shall also meet the following additional requirements:

1. Each screen shall have a flow capacity of at least 25 cubic feet per second (CFS). USACE design criteria listed above shall be met at the maximum flow capacity. The screens shall have active or passive flow control systems to ensure that screen approach velocities do not exceed USACE limits.

2. The screens and all appurtenant submerged metallic components shall be constructed of stainless steel and/or copper-nickel alloy so as to be as resistant as possible to corrosion from marsh waters. Cathodic protection shall be provided for each screen facility as a further means to control corrosion.

3. The screens shall be conical in shape so as to provide an optimal amount of submerged screen area given limited available submergence depths, the need for visually unobtrusive screen facilities, and low water levels in the marsh. The screens shall be of a maximum outside diameter of approximately 12 feet' not including support structures, piping, and other appurtenant features.

4. Each screen shall have a support structure capable of holding the screen in place during all foreseeable tide and flow conditions. The support structure shall include walkways as needed.

5. Each screen shall have a reliable automatic cleaning system to keep the screen free of debris and prevent it from fouling. Areas where the screens are to be installed can have significant amounts of floating debris and plant matter. The cleaning system shall consist of powered rotating brushes.

6. Screen cleaning systems shall be powered using commercial power at sites MB1, MB2, MI1, and MI2. No commercial power is available near the site MI3. Therefore, the screen cleaning system at site MI3 shall be powered using photoelectric cells. Each screen cleaning system shall be capable of being powered using a portable or on-site backup energy system.

7. Screen support structures and all appurtenant structures and support fixtures shall be corrosion resistant if such are to be constructed of metal, or have metallic components. Screen support structures and appurtenant features and support fixtures shall be rot-resistant if they are to be constructed of wood, or wood products. All treated wood or wood products used for, or in the construction of screen facilities, shall be acceptable to the California Department of Fish and Game for use in wetlands. No creosote or coal tar treated lumber shall be used for, or in the construction of the fish screen facilities. All synthetic polymer material (plastics) used in the construction of

the screen facilities shall be resistant to photodegredation where such materials could be exposed to sunlight.

8. The screen and all appurtenant features shall be designed to operate in all foreseeable weather conditions.

9. The screens, their support structures, and other appurtenant features such as walkways shall be protected from boats and navigation. Protection measures shall include marker lights, buoys, guard posts, and/or boat fenders, where needed.

10. Water passing through each screen shall be discharged onto adjoining managed wetlands using a pipe constructed of high-density polyethylene or other suitable synthetic polymer. The pipes shall be no less than 30 inches in internal diameter and capable of conveying at least 25 CFS of flow from the screen without significant hydraulic energy loss. The hydraulic efficiency of the pipes shall be sufficient to prevent them from causing a "back pressure" condition that could prevent the screens from attaining the design maximum flow rate, whenever possible.

    Each discharge pipe will be permanently buried in, and pass through the levee adjoining each screen. The pipe will be placed and reinforced within each levee so as to withstand collapse pressures generated by levee crown traffic, up to and including semitruck-trailers.

11. Each screen shall be fitted with flow controls. Such controls shall include, but not be limited to:

    - automatic or passive controls to ensure that maximum screen flowthough can be achieved without exceeding USACE fish protection velocity standards;
    - valves to completely stop flow from passing through the screen and discharge pipeline;
    - automatic backflow or check valves to prevent uncontrolled backflow (drainage) from managed wetlands back through the discharge pipes and screens into an adjoining slough.

    All flow controls and valves shall have manual override controls.

12. The screens shall be designed and constructed to allow remote monitoring from offices of the Suisun Resources Conservation District. The monitoring systems shall include an alarm for emergency notification of screen malfunction or failure.

13. The screen structures shall be designed and constructed so as to prevent unscreened water movement through the structures, regardless of water

levels in Goodyear Slough, Suisun Slough, and Grizzly Bay, and water levels in properties served by the screens.

14. All screens shall be readily removable from the water by barge- or truck-mounted boom cranes. Periodic removal will be necessary for cleaning, maintenance, repair, and dry storage.

15. Each screen site shall include a screen laydown pad to support the screen while out of the water for cleaning, maintenance, repair, or dry storage.

16. Motors, electrical junctions, electrical control units, and any other features of the screens that could be damaged or rendered inoperable by immersion in water, shall be designed and constructed so as to be above the adjoining levee crown elevation, or such features shall be placed in a watertight compartments or enclosures to prevent damage by flooding.

17. Vandalism protection and the prevention of unauthorized screen operation shall be included in the screen designs.

18. A flow diversion structure, such as an orifice box and isolation berm, or other means of diversion, shall be installed at the point of discharge from Screen MI3. The flow diversion structure shall be constructed within the existing ditch just inland of the levee at MI3. The purpose of the flow diversion structure will be to direct the discharge from Screen MI3 to various areas of the MILCO property using the existing conveyance ditch at the site. Modification of the existing ditch bottom or side berms shall be completed if such is necessary to ensure that the ditch will properly convey water from screen MI3 to adjoining areas. Any culverts within the ditch that are of not of sufficient diameter to properly convey screen water through the ditch system shall be replaced with larger diameter culverts, as needed.

19. Screen design criteria shall meet the operational requirements of the water management plans for the MILCO, MLC, and FG properties.

20. All facilities to be constructed shall be as visually unobtrusive as possible to preserve the natural aesthetics of water channels and adjoining wetlands. The silhouette and footprint of each screen facility shall be minimized to the extent possible. All painted or otherwise colored facilities within view shall be of a color, or combination of colors, that are compatible with the natural landscape adjacent to the screen facilities.

21. Screen laydown pads, electrical control units, valve controls, and other screen features shall, to the extent possible, be located in “upland” areas so as to minimize impacts to wetlands.

PROJECT COORDINATION

Project activities shall be closely coordinated with representatives of MILCO and MLC. Such coordination activities shall include, but not be limited to:

- A predesign meeting to discuss efforts to be undertaken for screen facility design and to allow MILCO and MLC representatives an opportunity to provide design input;

- Postpreliminary and postfinal design meetings to update MILCO and MLC representatives on the facility designs and to provide an opportunity for input; and,

- Preconstruction meeting to describe planned construction activities and provide for coordination between the construction contractor and MILCO and MLC representatives.

PERMITTING

It shall be assumed for the purposes of the proposal, that construction, operation, and maintenance of the project will be covered under the current USACE Regional General Permit (RGP) for managed wetlands in the Suisun Marsh. The Suisun Resource Conservation District shall be responsible for seeing that all construction and maintenance activities for the fish screen facilities are in compliance with the RGP.

The proposal shall not include the acquisition of environmental permits, clearances, or waivers that may be required in addition to the RGP. The Department will acquire such permits, clearances, and waivers. The Department will perform pre-construction and construction site inspections for the presence of sensitive or endangered species to fulfill the requirements of the Endangered Species Act.

The proposal shall include acquisition of all construction and real-estate permits, clearances, and agreements. The proposal shall include all anticipated measures associated with RGP compliance and adherence to all construction and real estate permits, clearances, and agreements.

The proposal shall not include efforts for documentation and compliance with the California Environmental Quality Act (CEQA). The Department will provide for Project CEQA compliance.

CONSTRUCTION

The proposal shall specify what efforts will likely be required for the construction of the fish screens by October 1, 2001. The proposal shall also address logistic concerns and timing issues related to construction activities.

OPERATIONS MONITORING

The proposal shall include monitoring of screen facility operations and conditions to ensure proper function and determine when facility repair, modification, and special maintenance operations are required.

OPERATIONS SUPPORT

The proposal shall include technical support and consultation services to assist representatives of MILCO and MLC in the day-to-day operation of the screen facilities.

ROUTINE MAINTENANCE AND REPAIR

An appropriate interval and methodology for screen cleaning shall be developed as part of the Project. The cleaning interval and methodology must be adequate such that design flows can be attained and approach velocity limitations can be met. The proposal shall specify requirements for development of screen cleaning intervals and methodologies as well as describe presently anticipated routine maintenance and repair requirements.

PROPOSAL ORGANIZATION AND CONTENT

The proposal shall be divided into at least the following sections:

Project Management/Oversight
Design
Project Coordination
Permitting
Construction
Operations Support
Operations Monitoring
Routine Maintenance and Repair

Each section shall provide a description of proposed efforts, a time schedule for their completion, and a detailed breakdown of associated costs. Cost beakdowns shall include itemized labor, travel and per diem, equipment, and materials costs, including any cost contingencies. Key personnel necessary for the completion of efforts described in the proposal shall also be identified.

POINT OF CONTACT

The principal Point of Contact regarding this RFP is:

Kamyar Guivetchi; Program Manager, Suisun Marsh Branch
California Department of Water Resources
Environmental Services Office
3251 S Street
Sacramento, CA 95816-7017

Email: kamyarg@water.ca.gov
Telephone: (916) 227-7529
Facsimile: (916) 227-7554

All inquiries regarding this RFP should be directed to Kamyar Guivetchi or his designee.

PROPOSAL DELIVERY DEADLINE

The proposal shall be delivered to the offices of the Point of Contact for this RFP no later than the end of business October 23, 2000.

PROVISIONS

Provisions for this RFP and for the submission of any proposal are:

1. The Department reserves the right to reject, accept, modify, or cancel, any part or all of this RFP.

2. The Department reserves the right to reject any proposal.

3. Nothing in this RFP requires that any contract be awarded or any agreement be entered into.

4. The Department is not responsible for any costs relating to preparation or transmittal of any proposal developed in response to this RFP.

5. All materials submitted in response to this RFP would become State property.

6. The Department may waive minor deviations and omissions from requirements set forth in this RFP.

7. The Department may amend any part of this RFP up to the date that the proposal is due.